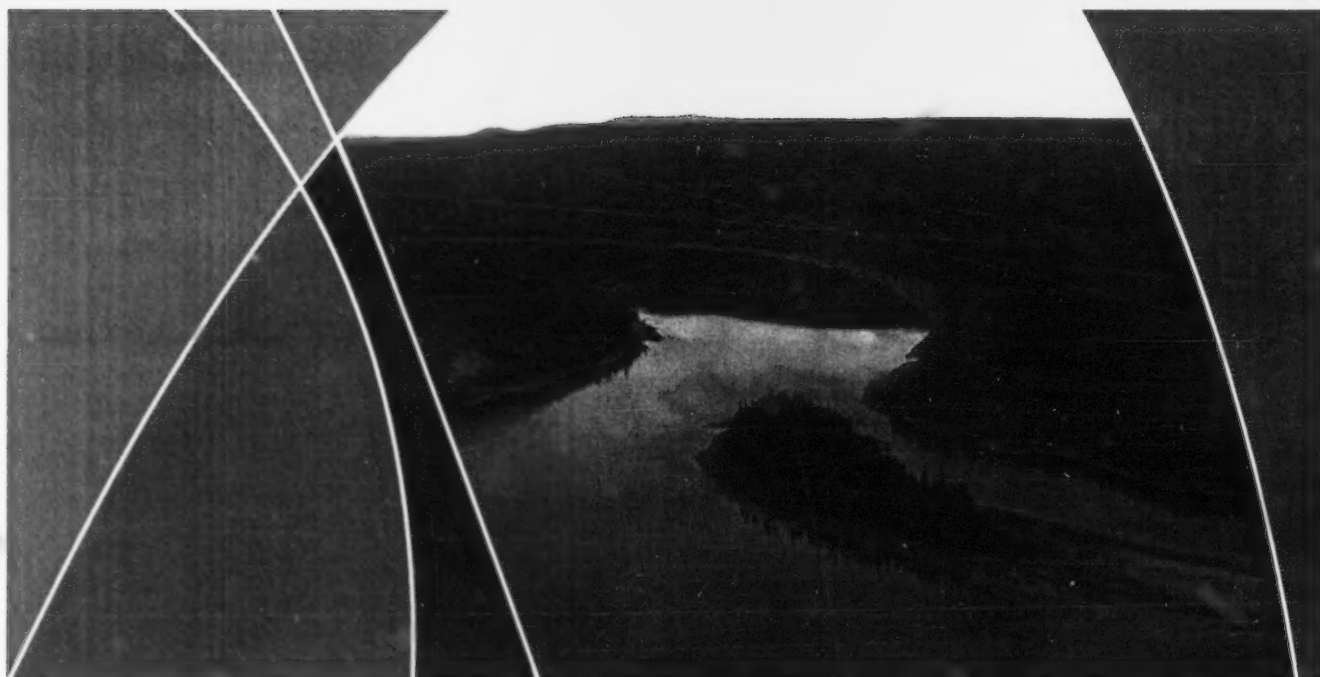


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Report of the Joint Review Panel

Lower Churchill Hydroelectric Generation Project
Nalcor Energy
Newfoundland and Labrador



Joint Review Panel established by Canada's Minister of the Environment,
the Minister of Environment and Conservation for Newfoundland and Labrador,
and the Minister for Intergovernmental Affairs for Newfoundland and Labrador



REPORT OF THE JOINT REVIEW PANEL

**LOWER CHURCHILL HYDROELECTRIC GENERATION PROJECT
NALCOR ENERGY
NEWFOUNDLAND AND LABRADOR**

August 2011

Report of the Joint Review Panel - Lower Churchill Hydroelectric Generation Project

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EXECUTIVE SUMMARY

INTRODUCTION

Nalcor Energy is proposing to develop two hydroelectric generation facilities on the lower Churchill River in central Labrador with a combined capacity of 3,074 megawatts (MW) and at a cost of approximately \$6.4 billion. The Project would consist of two dams located at Muskrat Falls (824 MW) and Gull Island (2,250 MW), two reservoirs, and transmission lines connecting Muskrat Falls, Gull Island and the existing Churchill Falls hydroelectric facility. Additional facilities would include access roads, temporary bridges, construction camps, borrow pits and quarry sites, diversion facilities and spoil areas. For the purposes of this assessment, transmission lines to carry the power to markets were not included in the Project.

The provincial and federal governments agreed to a joint review panel to ensure that the environmental assessment satisfied their respective legislative requirements – the Newfoundland and Labrador *Environmental Protection Act* and the *Canadian Environmental Assessment Act* – in an effective and efficient manner. The provincial and federal governments will make the final decisions regarding Project approval. The joint review panel is providing advice to the governments by means of this report.

The joint review panel ("the Panel") was appointed by the Newfoundland and Labrador Minister of Environment and Conservation and the Minister for Intergovernmental Affairs, and the federal Minister of the Environment. The Terms of Reference issued by the Ministers required the Panel to assess the environmental effects of the Project, including:

- consideration of the need for and purpose of the Project;
- alternatives to the Project and alternative means of carrying out the Project;
- the environmental effects of the Project, including accidents and malfunctions and cumulative effects, and the significance of these effects;
- measures to reduce adverse effects and enhance beneficial effects; and
- monitoring and follow-up.

The Panel reviewed extensive information provided by Nalcor and other participants during the course of the review, and held a 30-day public hearing in nine locations in Newfoundland and Labrador and in Quebec from March 3 to April 15, 2011. The public hearing provided the Panel with an opportunity to gather information relating to its Terms of Reference, and to hear from Aboriginal persons and groups, the public, governments and other interested parties about their ideas, interests, positions and concerns associated with the Project.

The Panel reviewed the information and views provided by Nalcor and other participants and then applied criteria according to guidance published by the Canadian Environmental Assessment Agency to determine the significance of adverse environmental effects after all reasonable mitigation measures, including those recommended by the Panel, had been applied. The Panel also identified likely Project benefits.

The Panel received information about potential and established Aboriginal rights or title in the Project area and about whether the Project might adversely impact them. This information is included in Chapter 10 of the report. Aboriginal groups involved in the review process included Innu, Inuit and Inuit-Metis living in Labrador, and Innu and Naskapis living in Quebec. Innu Nation has negotiated an Impacts and Benefits Agreement with Nalcor and Newfoundland and

Labrador in order to support its involvement in the Project during construction and to implement a royalty regime.

THIS SUMMARY

This summary highlights some of the recommendations made by the Panel, to be applied if the Project is approved. The Panel made no assumption about whether or not the Project would proceed. The reader is encouraged to consult the full list of recommendations.

The Panel has determined that the Project would have several significant adverse environmental effects on the aquatic and terrestrial environments, culture and heritage and, should consumption advisories be required in Lake Melville, on land and resource uses. The Panel does not make the final decision about the Project. Government decision makers will now have to weigh all effects, risks and uncertainties in order to decide whether the Project is justified in the circumstances and should proceed in light of the significant adverse environmental effects identified. Therefore, the Panel has provided further advice to help answer the question of whether and how the Project would contribute to sustainability.

PROJECT NEED AND ALTERNATIVES

Need, Purpose and Rationale

Nalcor stated that the Project was needed to address the future demand for electricity in Newfoundland and Labrador, develop the province's hydroelectric resources in accordance with the provincial energy policy, secure a renewable future, and generate long-term revenues for the Province. Many participants questioned why the hydroelectric resources of the Churchill River had to be developed, arguing that there were other, more economically and environmentally beneficial ways of meeting domestic energy demand. Questions were also raised about how Nalcor would gain transmission access to export markets and the ability of the Project to deliver the projected long-term financial benefits.

For the purposes of this review, the Panel did not accept that developing the hydroelectric potential of the lower Churchill River was a "need", and that therefore the Project should be compared to reasonable alternatives that addressed the future demand for electricity, and delivered a renewable energy future and long-term revenues for the Province. The Panel further concluded that because Muskrat Falls and Gull Island are subject to separate sanction decisions, the Panel would assess them separately with respect to alternatives, justification in energy and economic terms, and where possible, with respect to other considerations.

Nalcor's position was that up to 800 MW of energy from the Project would be required to meet provincial demand, and that there are market opportunities for energy export that would exceed the output of the Project by a factor of eight during the Project's planning horizon. Opportunities exist in Ontario, the Maritime Provinces and New England, based primarily on the need in those markets to replace aging infrastructure and to displace higher greenhouse gas emitting sources such as coal. Nalcor presented cash flow analysis and financial statements showing a projected return on equity for the Project as a whole in the order of 14 percent, and projected annual net financial benefits to the Province in the order of \$1.1 billion by 2050.

In light of the separate sanction decisions, the Panel considered the Project as a whole and as separate generating facilities. The Panel questioned whether the Project would be the best alternative to meet domestic demand and whether timely transmission access would be available to deliver energy to unknown export markets. Nalcor's proposal includes exporting part of the power generated at Muskrat Falls via a planned subsea transmission line towards the

Maritime Provinces; however, it was uncertain how and when the much larger energy output from Gull Island could be transmitted to markets.

Because of this, the Panel concluded that Nalcor had not demonstrated the justification of the Project as a whole in energy and economic terms, and that there are outstanding questions related to both Muskrat Falls and Gull Island regarding their ability to deliver the projected long-term financial benefits to the Province, even if other sanctioning requirements were met. The Panel therefore recommended that the Government of Newfoundland and Labrador carry out separate formal financial reviews before sanctioning either Muskrat Falls or Gull Island to confirm whether the component being considered for sanction would in fact deliver the projected long-term financial benefits.

Alternatives to the Project

Nalcor considered a list of potential alternatives and concluded that none were economically or technically feasible compared to the Project and none could meet the stated need to develop the hydroelectric potential of the Churchill River. Nalcor also said that Muskrat Falls was the best way to meet domestic demand and, compared to continuing to burn oil at the Holyrood thermal generating facility, the Muskrat Falls option would save \$2.2 billion over a 50-year period (2017 to 2067).

However, the Panel concluded that Nalcor's analysis, showing Muskrat Falls to be the best and least-cost way to meet domestic demand requirements, was inadequate and recommended a new, independent analysis based on economic, energy and environmental considerations. The analysis would address domestic demand projections, conservation and demand management, alternate on-island energy sources, the role of power from Churchill Falls, Nalcor's cost estimates and assumptions with respect to its no-Project thermal option, the possible use of offshore gas as a fuel for the Holyrood thermal generating facility, cash flow projections for Muskrat Falls, and the implications for the province's ratepayers and regulatory systems.

The Panel also recommended consideration of Integrated Resource Planning as a better planning approach compared to the traditional approach of forecasting loads and then finding the lowest cost solution for meeting them.

Alternative Means – Construction Sequence and Pace, and Reservoir Preparation

Nalcor considered a number of alternate means of carrying out the Project; the Panel focused on construction sequence and pace, and reservoir preparation.

Nalcor's preferred option is to construct the Muskrat Falls generating facility and related interconnecting transmission lines first, followed by the Gull Island generating facility with an overlap in construction periods. However, because there are separate sanction decisions, there could be a delay in constructing Gull Island. The Panel considered this uncertainty when carrying out its review and in some cases recommended that lessons learned from the construction of Muskrat Falls be specifically factored into decisions regarding Gull Island. If for any reason Gull Island were to be constructed first, the same principle should apply.

Nalcor evaluated several options for reservoir preparation – minimal clearing, partial clearing and full clearing. Nalcor's 'partial clearing' alternative would involve clearing trees in only the ice and stick-up zones around the perimeter of the reservoirs and only where this could be carried out within Nalcor's safety, economic, and environmental operating parameters. Otherwise, the trees would be left standing. Nalcor's 'full clearing' alternative also involved clearing wood in the flood zone but again only where this could be carried out within those same parameters.

The stated purpose for the reservoir preparation plan was to reduce the amount of trash and debris that could affect turbine operation after impoundment. Nalcor maintained that, since most of the trash and debris would come from the ice and stick-up zones, there would be no difference between the 'full' and 'partial' clearing options in that regard. It also stated there would be little difference between the two options in terms of navigation hazards, the amount of mercury released, or greenhouse gas emissions. However, there would be huge differences in costs and 'full clearing' would delay the construction schedule, costing Nalcor at least \$200 million. Therefore Nalcor preferred the 'partial clearing' option.

Many participants recommended that more timber be cleared from the reservoir areas, in order to reduce methylmercury and greenhouse gas emissions or not to waste the resource. They suggested that technologies such as manual harvesting with chainsaws and cable-logging could harvest larger volumes.

The Panel concluded that for reservoir preparation purposes, the two reservoirs should be considered differently because of their different characteristics. The Panel recommended applying the 'full clearing' option to the Muskrat Falls reservoir because it would be technically and economically feasible and would not negatively affect the construction schedule.

The Gull Island situation is different because the reservoir area is much larger, the terrain more difficult and the stands of timber less dense, and therefore less economic to harvest. Therefore, the Panel recommended that Nalcor learn from its experience in clearing the Muskrat Falls reservoir and endeavor to maximize clearing in the Gull Island reservoir. The Panel also recommended that Nalcor be responsible for ensuring that all timber harvested from the reservoirs, together with all merchantable timber salvaged by the trash and debris removal program, be utilized because of the socio-economic and environmental benefits.

ATMOSPHERIC ENVIRONMENT

The Project would affect air quality because of emissions from quarry operations, concrete work, and related construction activities. The Project would produce greenhouse gases related to construction activities and deforestation associated with reservoir clearing and impoundment, but would also have the potential to reduce a much larger quantity of greenhouse gases provided the power produced is used to shut down greenhouse gas intensive generation facilities elsewhere.

The Panel concluded that with appropriate mitigation, including use of best available technology, air pollution and noise would be localized and temporary in nature. While the exact markets for much of the power are not yet known, the power produced by the Project would very likely displace more greenhouse gas emissions than the Project would cause. Moreover, the Panel recommended that Nalcor make all reasonable efforts to ensure that power from the Project would be used (a) to back-up wind power and other intermittent renewable sources of energy, (b) to displace energy from high greenhouse gas emission sources, and (c) not to displace conservation and demand management or power from renewable sources.

AQUATIC ENVIRONMENT

The main focus of the assessment for the aquatic environment was on fish and fish habitat. Issues of concern included how and when filling of the reservoirs would occur, changes in water quality during the long period of time it would take for the new shorelines to stabilize, damaging effects on fish that might go through the turbines, how methylmercury – a by-product of new reservoirs – would accumulate in fish, loss of fish habitat through flooding and to what extent it

could be replaced successfully, and the effects of all these on the fish community that would inhabit the new reservoirs and the river below them.

In addition, there was considerable debate over how far the effects of the Project, including mercury, would travel downstream – not everyone agreed with Nalcor that the effects would not be measurable past the mouth of the river into Goose Bay and Lake Melville.

Reservoir Impoundment and Operating Regime

To fill each reservoir, Nalcor would need to reduce flows downstream of the dams for a few weeks. Nalcor indicated that it would plan to fill each reservoir in the late summer to early fall – the best time because it would avoid the spawning period for most fish species. Nalcor would ensure that the downstream flow was at least 30 percent of the mean annual flow and would rescue and relocate any fish that would become stranded as a result of the lower flows. However, Nalcor also stated that it needed flexibility to fill the reservoirs at a different time if demanded by the construction schedule. Other participants told the Panel that the risks of filling at a different time were too great because this could harm the most vulnerable life stages of a number of fish species. The Panel concluded that these risks should be avoided and recommended that Nalcor be required to fill the reservoirs between mid-July and the end of September.

In order to operate the reservoirs as efficiently as possible, Nalcor would keep the water levels at a fixed level for most of the year, avoiding the big changes that people have been used to seeing in the Smallwood Reservoir. Natural rivers however, show much more flow variability and this can play an important role in maintaining healthy ecosystems. The idea behind “environmental flows” is that when there are competing uses of a river system, water should be formally allocated for ecosystem purposes. The Panel recommended that the Province develop environmental flow standards to be applied to the Lower Churchill Project.

Water Quality Effects in the Reservoirs

Water quality in the reservoirs, and to a lesser extent, downstream from them, would go through a long transition. Nalcor predicted 20 years for water quality to return to its original condition; Fisheries and Oceans Canada said it could take longer. Flooded soils and new, eroding shorelines would increase the amount of sediment suspended in the water. Suspended solids can decrease the amount of light that penetrates the water, and also smother fish habitat when they settle. This effect would likely be much more pronounced in the Muskrat Falls reservoir, and the increase in suspended solids would greatly exceed water quality guidelines intended to protect aquatic life. However, Nalcor stated that turbidity in the Churchill River is already very variable and fish have adapted to this situation. Underwater decomposing vegetation would also add additional nutrients which could promote fish growth.

Nalcor would be able to take steps to avoid erosion and siltation during the construction period but once the reservoirs are filled, no further mitigation would be possible. The Panel considered these probable changes in water quality when considering how all aspects of the Project would affect fish and fish habitat, and the potential for conditions to favour some fish species and stress others, possibly changing the composition of the final fish community.

Entrainment Effects on Fish Populations

Fish going through turbines (entrainment) or down spillways could be killed or injured. The rate at which this would happen depends on the size of the fish (smaller fish would be less vulnerable), the distance the water drops, and the turbine design. Nalcor predicted higher rates

of mortality and injury at the Gull Island turbines because of the larger drop and the type of turbine proposed. However, as fish surveys had shown that there were no large-scale movements of fish in this area, Nalcor estimated that overall, not many fish would be affected and also committed to manage water flows to minimize use of spillways and to use adaptive management techniques to deter fish from approaching intakes.

The Panel noted that even if fish losses due to entrainment were not high, they would continue through the life of the Project. Also, killed or injured fish contribute to the transfer of methylmercury from the reservoirs to the river downstream, as they are eaten by other fish. Fisheries and Oceans Canada indicated that there were some possible measures to keep fish away from the turbine intakes but these would be specific to a given fish species. This means they could not be applied until monitoring showed which species were more likely to be killed or injured by entrainment. Some participants stated that they were uncertain about the number of fish that might pass through the turbines and the potential effects on fish populations.

The Panel recommended that Nalcor carry out additional sampling before the Gull Island dam sanction decision to confirm the low numbers of fish movements and develop a detailed adaptive management strategy.

Fate of Mercury in the Reservoirs

There was general agreement that Nalcor's predictions for the amount of methylmercury that would be released, and how it would concentrate through the different levels of the food web in the reservoirs, were reasonable. The Panel heard no evidence that suggested that the health of the fish themselves would be harmed by the mercury in their bodies. Nalcor's position was that there was no feasible way to substantially reduce the formation of mercury in the reservoirs and that any risks to people who might eat the fish could be handled through consumption advisories. Natural Resources Canada challenged this, and recommended that Nalcor consider removing both vegetation and part of the soil layer around the new shorelines of the reservoirs. The Panel recognized that there were still many questions about this proposed mitigation measure but agreed that hydroelectric developers have a responsibility to find ways to reduce mercury at source if at all possible, and recommended that Natural Resources Canada and Nalcor collaborate to pilot test this approach.

Fish Habitat Loss, Alteration and Compensation

Nalcor told the Panel that while a large area of fish habitat (740 hectares in the Muskrat Falls reservoir, 4,300 hectares at Gull Island) would be destroyed or altered by flooding when the reservoirs were filled, this habitat would be replaced, either by constructing new habitat areas or simply through the creation of much larger water bodies. Nalcor proposed to create or enhance delta areas, re-vegetate disturbed shoreline areas, remove vegetation and grade access roads around the edge of reservoirs in preparation for flooding, enhance spawning shoals at Gull Lake, and create the Gull Island plateau. However, the Panel noted that Nalcor's proposed compensation works would only be able to create slow velocity habitat leading to a net loss of faster flowing habitats, especially in the tributaries.

Nalcor analyzed the types of habitat that would be lost in terms of how they were used by certain life stages of certain fish species. The design of the proposed habitat compensation works would then focus on making sure that there was adequate habitat available for these particular fish. Nalcor's analysis showed that very high percentages of habitat, over 90 percent in some cases, would be removed for one or more life stages of some species, particularly in the Muskrat Falls reservoir. Other participants expressed concern that so much would be riding on the success of Nalcor's compensation strategy and indicated that it was very difficult to

engineer new habitat that would be as productive and complex as habitat formed naturally over many years. They also questioned the track record of habitat replacement and of its monitoring and government oversight.

In the event compensation proved ineffective, Nalcor would consider habitat enhancement sites outside the flood zone in consultation with Fisheries and Oceans Canada.

The Panel concluded that Nalcor's compensation strategy, if successful, would likely address most of the habitat needs of the resident fish species; however, many uncertainties remain, particularly with respect to how the different species would interact and whether the new habitats would stabilize. The Panel noted that Nalcor agreed that repairing or reconstructing the habitats would be difficult after the reservoirs were filled.

Final Fish Assemblage

Nalcor described how the combined effects of reservoir filling and operation, water quality changes, and habitat alteration and replacement would affect the fish community, both during the transitional stage and after the reservoirs had stabilized. Nalcor estimated that the existing species would all survive and in more or less the same proportions. Other participants were less certain, given the extent of the changes that would occur in transforming a river into two reservoirs.

The Panel concluded that the make-up of the final fish community could not be predicted with certainty and that there would be a risk that one or more species, particularly valued from community and Aboriginal perspectives, could be lost or considerably reduced in numbers, because of the wide scale water quality and habitat changes and inherent uncertainties.

Therefore the Panel concluded that the Project would result in significant adverse environmental effects to fish habitat and the final fish assemblage in both reservoirs.

Effects Downstream of Muskrat Falls

Based on studies in Lake Melville carried out for an earlier version of the Project and the fact that, unlike some other hydroelectric projects, the Project would not reduce the amount of water flowing downstream from Muskrat Falls, Nalcor had concluded that the Project would not have effects on the downstream environment past the mouth of the Churchill River and consequently did not extend the Assessment area beyond this point. This was challenged by a number of participants, and particularly the Nunatsiavut Government. The possibility of mercury moving downstream in sufficient quantities to contaminate fish and seal, and eventually require consumption advisories, was a particular concern. Participants also questioned whether subtle changes in suspended solids, nutrients or water temperature might, over the long-term, change the productivity of the river's estuary.

Fisheries and Oceans Canada presented some recently released research showing that mercury from the Churchill Falls project was measured in several fish species in Lake Melville over 300 km away, but Nalcor maintained that mercury and other Project effects would be "not measurable" and within natural variability.

The Panel acknowledged that it is difficult to accurately predict downstream effects because there are very few long-term ecological studies of hydroelectric projects in northern environments. However, this underscores the need for a precautionary approach, particularly because Nalcor did not identify any feasible way to reverse either long-term adverse ecological changes or mercury contamination in the ecosystem.

The Panel concluded that Nalcor did not carry out a full assessment of the fate of mercury in the downstream environment, including the potential pathways that could lead to mercury bioaccumulation in seal and the potential for cumulative effects of the Project together with the effects of other sources of mercury. The Panel also concluded that downstream effects would likely be observed in Goose Bay over the long term, caused by changes in sediment, nutrient supply and water temperatures. Therefore, the Panel recommended that Nalcor carry out a comprehensive assessment, with third-party review, of downstream effects before impoundment begins. The Panel also noted that, while Nalcor has committed to make its monitoring data public, often lessons learned from environmental effects monitoring of large projects are obscured because the results are not fully analyzed and remain difficult to access in the "gray literature". Therefore the Panel recommended that Nalcor undertake to publish what it learns about possible long-term downstream effects.

Monitoring, Follow-up, Adaptive Management

Nalcor committed to carry out an extensive aquatic monitoring program to verify its predictions and identify whether adaptive management would be needed. The Panel concluded that effective monitoring would be challenging because of the need for good baseline data, enough resources to support the needed level of effort over many years, and setting appropriate thresholds to trigger further action. The Panel recommended involving Aboriginal groups, stakeholders and independent experts in designing the program.

TERRESTRIAL ENVIRONMENT

The assessment addressed Project effects on upland, riparian, wetland and ashkui ecosystems, rare plants, caribou, birds and other wildlife. Seismic and geotechnical effects were also addressed. Many of the terrestrial species were noted to be of particular importance to Aboriginal communities, including various caribou herds, small game, medicinal plants and berries.

Nalcor stated that Project construction and the creation of the two reservoirs would physically disturb 161 square kilometres of land, but predicted that the loss of habitat would not affect the sustainability of key indicator species at the population level. However, the Panel concluded that in light of the scale of terrestrial habitat that would be inundated by the Project and the permanence of the effect, the overall loss of terrestrial habitat would be a significant adverse effect. The Panel also observed that the effects to the terrestrial ecosystem might be further compounded by future resource extraction projects and shifting climate change patterns.

Riparian and Wetland Habitat

Nalcor noted the importance of wetland habitat, including riparian marsh, for several key indicator species by providing foraging, nesting and breeding habitat for several types of large mammals, furbearers, herpetiles and birds. Wetlands were noted as widespread and common in the lower Churchill River watershed. Nalcor indicated that approximately 60 percent of riparian habitat in the Project area would be inundated and that 98 percent of this habitat would be the riparian marsh ecotype.

Participants were concerned about how this loss would affect a number of species, particularly wetland sparrows. Nalcor committed to re-create lost riparian habitat through a compensation strategy and cited successful habitat compensation in other projects in North America. However, there were concerns that Nalcor had underestimated the challenges involved in engineering ecosystems and that there would be a net loss of riparian habitat. The Panel noted that wetland and riparian habitat play important roles in ecosystem health and agreed that compensation

plans are vital. However, the Panel questioned Nalcor's certainty that riparian and wetland habitat would re-establish and concluded that the residual adverse effect of the Project on these habitats, even with the proposed compensation strategy, would be significant.

Rare Plants

No listed plant species under federal or provincial regulations were found within the footprint of the Project, although the Panel noted that information on rare plants in Labrador is limited. Eight regionally uncommon plant species were found in the Project area and several participants noted the importance of these species. During the public hearing, participants and Aboriginal groups stated that they were concerned about rare plants in the inundated area, especially common wood sorrel and mountain maple, and medicinal plants such as the Canada yew. Nalcor stated that if sufficient numbers of these species were not identified outside of the footprint, any plants found inside the flooded zone would be relocated.

The Panel concluded that, with appropriate mitigation, the adverse effects of the Project on rare plant species would not likely be significant.

Wildlife

The EIS assessed effects of the Project on selected species, including moose, black bear, beaver, marten, porcupine, caribou and birds. Nalcor chose these key indicator species based on their sensitivity to Project interactions, their ability to indicate effects on larger components of the environment, their economic, recreational or cultural importance to stakeholders, and population status and vulnerability.

Nalcor did not predict significant adverse effects for most species because the Project would not flood a large percentage of their primary habitat. Participants were particularly concerned about the six species of wildlife designated as being at risk. The federal and provincial governments are required to develop recovery strategies for these species that must identify critical habitat. The Panel concluded that the Project would not be likely to have significant effects on listed species other than the Red Wine Mountain caribou herd. However, the lack of recovery strategies and identification of critical habitat for some of these species makes a final significance determination premature. The Panel recommended that governments make all reasonable efforts to put recovery strategies in place before making final decisions about the effects of the Project on listed species.

The timing of impoundment recommended for the protection of fish would also be optimal for most terrestrial species, and therefore, with this mitigation, the Panel concluded that the recommended timing of impoundment would not have significant adverse effects on terrestrial species.

Caribou

The Red Wine Mountain caribou herd is considered threatened under the provincial *Endangered Species Act* and the Canadian *Species at Risk Act*. The George River caribou herd is in decline but not considered threatened and hunting is legal within permitted seasons. The Lac Joseph caribou herd is also known to occur in the Project area; however, Nalcor did not include this herd in its assessment.

Nalcor concluded that there would be significant cumulative effects on the Red Wine Mountain herd because some caribou habitat would be lost. However, Nalcor stated that hunting and predation have been identified as limiting factors for this herd, rather than habitat. Therefore, the

herd would likely continue to decline with or without the Project and the effects from the Project alone would not be significant.

Participants noted that development affects caribou both directly and indirectly and that indirect effects, such as the presence of roads and changes in predator-prey dynamics, were not adequately assessed.

The Panel agreed that the recovery of the Red Wine Mountain caribou herd would be uncertain with or without the Project but concluded that any adverse effect of the Project on individual animals within the Red Wine Mountain caribou herd would result in significant adverse effects.

Nalcor stated that the Project would not adversely affect the George River and Lac Joseph caribou herds because the Project footprint would only overlap with a small portion of their ranges. Participants noted that the George River herd is in rapid decline but there was very limited information available about the possible causes. The Panel concluded that the effects of the Project on the George River caribou herd in isolation would not likely be significant, but could not make a determination about cumulative significance because a proper cumulative effects assessment for the herd was not carried out. The Panel recommended that the provinces of Quebec and Newfoundland and Labrador, together with Environment Canada and interested Aboriginal communities, initiate a joint management program for the George River caribou herd.

Birds

Nalcor assessed Project effects on Canada goose, surf scoter, osprey, ruffed grouse, wetland sparrows, harlequin duck and other species of concern such as the rusty blackbird, grey-cheeked thrush, olive-sided flycatcher and the common nighthawk. Several listed bird species were found in the Churchill River valley. Nalcor stated some primary habitat of birds in the Project area would be flooded but enough habitat was available outside the impoundment area. Government experts agreed. Nalcor noted that the wetland sparrow was an exception because of its dependence on riparian habitat but habitat compensation plans would reduce the impact.

The Panel concluded that adequate alternate primary habitat would still be available and that there would likely not be significant adverse effects on birds, although no final determination could be made for the listed bird species because recovery strategies were not in place.

Ashkui are areas in rivers and lakes where open water appears earlier in the spring than elsewhere, and they are important habitat for several bird species. Nalcor predicted that existing ashkui on the lower Churchill River would re-form at a higher elevation after the reservoirs are created. Participants challenged this prediction but Environment Canada stated that if the ashkui did not reappear, there would be sufficient open water habitat elsewhere to support waterfowl such as surf scoter. The Panel concluded that loss of ashkui would be a loss in habitat for waterfowl, but would likely not be significant given the abundance of alternate habitat.

Environment Canada stated that under the *Migratory Birds Convention Act*, no disturbance of eggs, nests and young may occur between May 1 and July 31 of any given year and that this would mean that Nalcor should not carry out reservoir clearing during this period. Nalcor committed to comply with the Act but also said that it would need to harvest timber throughout the summer season. The Panel recommended that Nalcor and Environment Canada negotiate an agreement to ensure that harvesting activities would be carried out in a manner consistent with the Act, and compliance with the Act would not unnecessarily delay clearing.

Vegetation

Nalcor stated that vegetation management of the transmission lines' right-of-way would include removal of trees and control of fast-growing shrubs. Vegetation management would begin three to four years after construction and would occur every 8 to 10 years thereafter. The quantities of chemicals used would depend largely on terrain, as well as quantity and type of vegetation. Vegetation management would comply with provincial regulations.

Participants were concerned about the use of chemical herbicides and their impacts on humans and animals. While the Panel concluded that there is a reasonable regulatory process in place for the use of herbicides, it recommended that all non-chemical vegetation control alternatives be explored first and their use maximized before use of herbicides would be approved.

LAND AND RESOURCE USE

Land and resource use topics included Project effects on harvesting activities (hunting, trapping, fishing, and berry picking), cabins, winter travel, navigation and forestry and other resource-based activities (mining, agriculture and ecotourism).

Harvesting Activities

Nalcor indicated that the area to be affected by the Project was not a prime destination for harvesting activities. Nalcor also did not expect the Project to increase harvesting activities in the area because employees would not be allowed to harvest anything, most of the roads needed for construction would be made inaccessible afterwards, and Nalcor would build construction camps and implement transportation policies.

Because of the loss of riparian, wetland and upland habitat, and possibly ashkui, there would likely be some adverse effects on moose, small game and migratory birds. However, potential loss of wildlife would be balanced to a certain extent if mitigation measures to replace riparian and wetland habitat were successful.

Construction activities could temporarily disturb the George River caribou herd, which might lead some animals to avoid certain areas and cause hunters to adapt their hunting strategies, but no further disturbances would occur during the operation period. However, the future of the herd could be threatened by the possible cumulative effects of a large number of small changes in the herd's total range and caribou hunting could be adversely affected as a result. Therefore, it would be important to monitor how the herd interacts with the Project and any changes caused by the Project to the way in which caribou are hunted in the area.

Because of the various changes the Project would cause in the Churchill River's main stem, some species preferred for fishing could be less abundant in the reservoirs while others might increase in numbers. In addition, consumption advisories would likely be required because of methylmercury accumulation in fish. However, the Panel concluded effects on fishing in the Churchill River would not be significant because most people already prefer to fish in other locations. Nalcor also committed to investigate remediation of the saltwater intrusion in Grand Lake as part of its fish compensation strategy and this could provide additional fishing opportunities outside of the area that would be affected by methylmercury contamination.

In Goose Bay and Lake Melville, the Panel concluded that it was still uncertain whether methylmercury would bioaccumulate in fish and seal to levels that would require consumption advisories, especially considering the lack of baseline information. Recognizing the dietary and cultural importance of fishing and seal hunting in this area, the Panel concluded that there would

be significant adverse effects on fishing and seal hunting in Goose Bay and Lake Melville should consumption advisories be required for that area.

Nalcor indicated that most trapping now occurs close to home communities rather than in the Project area. To the extent that the riparian habitat compensation program would be successful, this could provide some replacement trapping opportunities. The Panel concluded that the Project would not have significant adverse effects on trapping, but recommended that Nalcor modify its proposed trapping compensation program to reduce the requirement for proof of ten years' continuous use.

Conditions of the leases of cabins located in the flood zone enable the Province to cancel them without compensation. However, the Panel was not provided with enough information to conclude whether any legitimate cabin owners outside the flood zone would be unfairly inconvenienced during either the construction or the operations period. Any aggrieved owner would, however, be able to access a complaints resolution process recommended by the Panel.

Winter Travel

Nalcor predicted that thickness and stability of the ice below Muskrat Falls would not change as a result of the Project, but freeze-up would be delayed by two weeks, or up to three weeks under climate change scenarios. Nalcor would provide alternate transportation to Mud Lake residents, but only if adverse changes to winter travel conditions could be directly attributed to the Project. The Panel concluded that uncertainty about how adverse changes to the ice bridge would be mitigated would be a destabilizing and stressful factor for the community of Mud Lake, especially since these changes would be permanent. The Panel recommended that Nalcor and the Province negotiate an agreement with the Mud Lake Improvement Committee and that Nalcor assume responsibility for providing alternate transportation if the time the residents are unable to cross the river during freeze-up or break-up exceeds two weeks, without requiring proof that the Project has caused the problem.

The Panel concluded that ice on Lake Melville would be unlikely to be adversely affected by the Project, however ice conditions and the timing of freeze-up and break-up should be monitored by Nalcor.

Navigation

Restricted river travel during the impoundment period could present a temporary problem for Mud Lake residents needing to cross the river by boat. Nalcor committed to provide alternative transportation during this period if required. Trees remaining in the reservoirs' stick-up zones would be a navigational hazard and would make access to the shorelines problematic, particularly for those travelling by canoe. The Panel was not confident that all of the trees in the stick-up zones would be sheared off by ice or waves as quickly as predicted. It was also not possible to determine whether the Project would cause navigational hazards downstream of Muskrat Falls. The Panel recommended that Nalcor develop a navigation monitoring and mitigation plan for both reservoirs, involving river users, and addressing issues such as management of the stick-up zones, boat launches and portages, and navigational hazards.

Forestry

The Panel concluded that allocating the Allowable Annual Cut of Forest Management District 19A to the Project's flood zone would minimize competition with other forestry operations. The Panel's recommendations to maximize utilization of the wood cut in the flood zone and allow

local forestry operators free access to areas that would not otherwise be cleared could also help to develop a more viable forestry industry in Labrador.

CURRENT ABORIGINAL LAND AND RESOURCE USE FOR TRADITIONAL PURPOSES

The Panel was required to specifically consider Project effects on current use of lands and resources for traditional purposes by Aboriginal persons. Information available to Nalcor, submissions by Aboriginal groups and testimony during the public hearing suggested that current use of the Project area (deemed by the Panel to be within the last 20 years) for traditional purposes is generally intermittent and sporadic relative to use of other areas that would not be affected by the Project.

Some Aboriginal persons suggested that there has been some decline in the intensity and extent of traditional land and resource use activities in recent time due to societal and economic changes. Nevertheless, the Panel recognized the importance, common to all Aboriginal persons, of practicing traditional activities within the entire extent of their traditional territory and the fact that for many groups, any effect from the Project on their practice of traditional activities would act cumulatively with impacts caused by the development of the earlier Churchill Falls project.

Labrador Innu

The Panel observed that the Project would have an adverse impact on the land and resource use activities of the Labrador Innu by flooding harvesting and camping areas, including three ashkui locations in the proposed Muskrat Falls reservoir, as well as others in the vicinity of the Gull Island site. However, the Project area covers only a small portion of the traditional territory of the Labrador Innu and traditional activities currently practiced by Labrador Innu do not seem to be confined to the Churchill River valley. Furthermore, the Panel expected Innu Nation's interests regarding land and resource use to have been considered in the *Tshash Petapen* Agreement. Therefore, the Project effects on Labrador Innu land and resource users would likely not be significant, though the Panel recognized that some individual members might still experience negative effects. The Panel recommended mitigation to address noise and dust effects on Innu cabins and camps, and collaborative measures to address the relocation of Canada yew medicinal plants.

Inuit

The Nunatsiavut Government and Inuit participants stated that the Project would adversely affect their traditional land and resource use activities in Lake Melville and on land and water within the Labrador Inuit Settlement Area as well as land and water identified in Schedule 12-E of the Labrador Inuit Land Claim Agreement. They were particularly concerned about the potential for methylmercury contamination because of the importance of harvesting activities in that area for the continuation of their traditional lifestyle. Should consumption advisories be required in Goose Bay and Lake Melville, the Panel concluded that the Project would have significant adverse effects on the pursuit of traditional harvesting activities by Labrador Inuit, including the harvesting of country food.

Inuit-Metis

The NunatuKavut Community Council indicated that it was only able to provide limited information about current land and resource use activities for traditional purposes by Inuit-Metis because of its injunction application and the lack of time and financial resources to provide detailed hearing submissions. Most information was received from individual Inuit-Metis

participants, rather than from the organization, and affiliation of participants could not always be confirmed.

The Panel concluded that, based on information identified through the environmental assessment process, there were uncertainties regarding the extent and locations of current land and resource use by the Inuit-Metis in the Project area. The Panel recognized that additional information could be forthcoming during government consultations. To the extent that there are current uses in the Project area, the Panel concluded that the Project's impact on Inuit-Metis land and resource uses, after implementation of the mitigation measures proposed by Nalcor and those recommended by the Panel, would be adverse but not significant.

The Panel also observed that many land and resource use locations reported to be frequented by Inuit-Metis are outside of the Project area and would remain unaffected and accessible. Measures considered to mitigate the effects of the Project on trapping activities and to compensate for losses of trapping income, property or equipment attributed to the Project may also be particularly relevant for Inuit-Metis.

Quebec Aboriginal Groups

Limited information was received regarding current land and resource use activities for traditional purposes in the Project area by Aboriginal persons living in Quebec due, in part, to unsuccessful attempts by Nalcor and most groups to sign consultation agreements to gather information. Time constraints during the public hearing did not allow the Panel to visit each community and therefore community representatives had to attend community hearing sessions held in Sept-Iles. They informed the Panel that the information provided was incomplete, and that insufficient time and resources were available to provide a more complete picture. The accuracy and completeness of the information provided by Nalcor was also challenged. Beside caribou hunting, any other current land and resource use activities for traditional purposes in the Project area by Aboriginal persons living in Quebec appear to be seasonal, sporadic and of short duration, including incidental harvesting along the Trans Labrador Highway.

The Panel concluded that, based on information identified through the environmental assessment process, there were uncertainties regarding the extent and locations of current land and resource use by Quebec Aboriginal groups in the Project area. The Panel recognized that additional information could be forthcoming during government consultations. To the extent that there are current uses in the Project area, the Panel concluded that the Project's impact on Quebec Aboriginal land and resource uses, after implementation of the mitigation measures proposed by Nalcor and those recommended by the Panel, would be adverse but not significant.

The Panel also observed that many land and resource use locations reported to be frequented by Aboriginal persons living in Quebec are outside of the Project area and would remain unaffected and accessible.

The Panel recommended that Nalcor involve all Aboriginal groups in the design and implementation of its proposed community land and resource use monitoring program and include Traditional Knowledge.

CULTURE AND HERITAGE

Nalcor assessed Project effects on historical and archaeological resources, sites of spiritual and cultural importance and changes to the river landscape.

Nalcor assessed effects of the Project in those areas where Project components would cause physical disturbance. Nalcor developed its archaeological program and proposed mitigation measures in compliance with the provincial *Historic Resources Act*. All historic and archaeological sites identified to date that could potentially be disturbed or lost as a result of the Project would be excavated or documented before any ground disturbance activities occur. Measures would also be implemented to address the discovery of previously unknown sites and artifacts during construction. Nalcor committed to make use of best practice archaeological interpretation and analysis methods and to engage local communities in the development of commemoration initiatives.

Participants recommended that investigation, documentation and commemoration of historic and archaeological resources be undertaken before flooding begins so that irreversible losses might be offset and ancestors of all origins and their harvesting heritage recognized and honoured. Participants also requested that Nalcor's commemoration commitment ensure that intangible resources – trails, portages, customs and stories – be recorded. They also indicated that local heritage organizations could benefit by receiving funding to undertake part of this work and to implement youth education programs.

The Panel acknowledged that Nalcor has been proactive in surveying historic and archaeological potential, and has worked extensively with Innu Elders to address their cultural concerns. The resources Nalcor has and would apply to studying, identifying and documenting historic and archaeological sites and artifacts would enable considerable investigation in the history of the region that might otherwise not happen. The Project would also provide opportunities for Aboriginal persons to obtain training and experience in archaeology. However, it would be unlikely that all sites and artifacts of cultural importance or meaning would be located. The Panel recommended that Nalcor involve all affected groups in searching for, documenting and commemorating historic and archaeological resources.

The Panel noted in particular that the creation of the Smallwood Reservoir resulted in losses of culturally and historically important sites and artifacts, with no consultation, acknowledgement or commemoration.

Three sites of spiritual and cultural importance to the Labrador Innu would be lost because of flooding. Nalcor's mitigation measures consisted of documenting their significance and minimizing disturbances through alternate facility layout and construction methods. Nevertheless, Innu Elders felt that animal spirits could retaliate in response to being disturbed and that efforts should be made to appease them. The Panel acknowledged the importance of recognizing, accepting and respecting the cultural beliefs of the communities to be affected. The Panel also recommended that the Province develop an approach to assign place names in consultation with Aboriginal communities for any new Project-related landscape features.

Many participants talked about their deep emotional connection with the Churchill River, which has strong historical, cultural and spiritual significance for them because of their own travels on the river or because of family or community connections. The creation of the two reservoirs would result in the disappearance of valued river features, including fast flowing water, rapids and falls, shallow delta areas, islands, varying water levels and associated river shoreline. The Panel concluded that the Project would cause significant adverse effects on culture and heritage after mitigation, particularly with respect to the "loss of the river" as a highly valued cultural and spiritual landscape. This effect would apply to a large proportion of the river between Churchill Falls and Goose Bay, would be irreversible, and would last for the duration of the Project.

ECONOMY, EMPLOYMENT AND BUSINESS

Economic Impacts

The Project has a capital budget of \$6.4 billion (\$2.5 billion for Muskrat Falls and \$3.9 billion for Gull Island), with construction activities being carried out over a 11 to 12 year period. Nalcor predicted significant benefits to people from construction employment and for businesses from the provision of goods and services. Direct employment was estimated at 15,600 person years, approximately 5,600 person years for Muskrat Falls and 10,000 person years for Gull Island. Nalcor estimated that 65 percent of those requirements can be supplied by the province, 40 percent from the Island of Newfoundland and 25 percent from Labrador. It is also estimated that between \$500 million and \$1 billion would be spent on goods and services from Newfoundland and Labrador.

Many participants questioned, based on their experiences with other projects, whether or not the projected employment and business opportunities would be realized. The Panel noted that Nalcor's Benefits Strategy addresses a number of these concerns. As well, the Impacts and Benefits Agreement between Nalcor, the Government of Newfoundland and Labrador, and Innu Nation includes specific provisions regarding employment and goods and services. The Panel concluded that during the construction period, there would be substantial potential economic benefits for all areas of the province, especially Labrador and the Upper Lake Melville area.

For the long term, operating employment, though modest, would be a notable benefit, as are the trained and experienced workforce and the strengthened business capability gained during the construction period. Similarly, the availability of power for new industry or general development is a staple of further economic development, benefiting the whole province and the Upper Lake Melville area particularly because of its proximity.

The Panel focused its attention on what Nalcor stated as the principal long-term economic benefit, i.e. the net financial benefits to the economy of the province that would be generated primarily from the sale of power. Those benefits were estimated by Nalcor to be in excess of \$1 billion (in 2010 dollars) annually after debt repayment (2050); of this, \$300 million was attributed to Muskrat Falls and \$700 million to Gull Island. As already indicated, the Panel concluded that considerable uncertainty exists regarding the Project's ability to deliver financial benefits to the Province in the order of magnitude projected by Nalcor. There are also questions as to how any such benefits might be distributed by the Government of Newfoundland and Labrador.

Many different views were expressed with respect to the extent that high levels of construction activity would result in in-migration to the Upper Lake Melville area. The Panel concluded that, while it did not expect much in-migration of Project workers from outside Labrador, there could be substantial in-migration to Happy Valley-Goose Bay from other Labrador communities.

Some participants expressed concern that the Project would result in some local businesses experiencing adverse impacts in the form of employee retention problems and threats to economic viability because of the necessity to pay higher wage rates. The Panel concluded that any such impacts would occur primarily in Happy Valley-Goose Bay and would not be significant.

The Panel notes that, while the statistical data was separated for Muskrat Falls and Gull Island, most of the benefits discussion was based on the Project as a whole. The fact that Gull Island is a completely separate sanction decision from Muskrat Falls leads to uncertainty regarding the time lag between the two and this has economic implications.

Enhancing Employment and Business Opportunities

The Panel concluded that Nalcor's Benefits Strategy and monitoring and mitigation commitments would contribute to the enhancement of employment benefits from the Project, ensuring meaningful employment experiences, and enhanced benefits to local and provincial businesses from the supply of goods and services to the Project. However, there are a number of further enhancement measures that should be taken by Nalcor. At the same time, the Panel notes that prospective workers or businesses would also carry some responsibility to ensure that local benefits were realized.

The Panel's recommendations to enhance employment benefits included: early candidate selection and training, workplace attachment for apprenticeship graduates, providing training to 'journey person' level in community of residence, orientation to assist prospective employees prepare for participation in wage economy, continuation of the Labrador Aboriginal Training Partnership, and an employment outreach program to Aboriginal communities in Quebec.

The Panel's recommendations relating to business opportunities included quantitative targets for goods and services, an enhanced supplier development program, and a transparent bidding process. The Panel also recommended modifying the Benefits Strategy to ensure that the various statistical reports are available publicly and that the established employment and business targets cannot be changed at the Minister's discretion.

FAMILY AND COMMUNITY LIFE, AND PUBLIC SERVICES

Communities and Families

Nalcor stated that both positive and adverse effects to community life would occur as a result of the Project. The Panel heard many concerns about the health of Upper Lake Melville residents, and particularly in Sheshatshiu, where participants described their community as being particularly vulnerable, citing the numbers of children in care and the high rate of youth suicide as indicators. Project-related risks would include the potential for high incomes from wage employment to increase alcohol and drug use, with subsequent effects on mental health, family well-being, community stability, and loss of the traditional way of life. Without adequate mitigation, the Panel concluded that the Project would cause significant adverse effects on the health and welfare of children and youth, particularly in Sheshatshiu. If the measures recommended by the Panel were applied, these adverse effects could be avoided.

Nalcor noted that the *Tshash Petapen* Agreement would provide resources that could address any increases in community stresses in the Sheshatshiu population. While the Panel observed that the financial security offered by such an agreement would place the community in a better position to address existing social problems, in the absence of detailed information, the Panel cannot assume that these adverse effects would be fully mitigated. The Panel therefore recommended that Innu Nation, the provincial and federal governments and Nalcor develop a Memorandum of Understanding to determine how each party could bring appropriate resources to developing appropriate mitigation of Project-related social effects in Sheshatshiu.

The Panel was told that similar social effects would likely occur in Happy Valley-Goose Bay, but observed that such effects would likely be somewhat less severe. The Panel was not provided with baseline data regarding the existing levels of alcohol and drug abuse and related sexual assault and family violence in Happy Valley-Goose Bay because much of this information was not available. However, women's groups indicated that they already see many unaddressed problems and would expect more if the Project proceeded.

The Panel concluded that there is the potential for adverse effects resulting from high wage employment, including increased substance abuse, and sexual assault, family violence and adverse effects on women and children in Happy Valley-Goose Bay. These effects would be difficult to monitor because of the lack of data and because, by nature, the effects are often hidden. For this reason, the Panel concluded that mitigation must include a research element. The Panel recommended that the provincial Department of Health and Community Services, in consultation with Aboriginal groups, and government and community agencies, conduct a social effects needs assessment, including participatory research, to provide recommendations for social effects mitigation measures and monitoring.

The Panel also made recommendations regarding the provision of substance abuse counselling at the work sites for Project employees, and provision of a variety of work schedules to increase participation in the workforce by women and Aboriginal persons.

The Panel concluded that the Project would also provide family and community benefits in the form of increased employment, higher incomes, opportunities for young people, and resources to support traditional activities.

Community Services

Nalcor indicated that health and social services in Upper Lake Melville were near or at capacity, but said that the Project would not significantly add to the demand for services because its accommodation and transportation policies would reduce the likelihood of in-migration and Nalcor would provide some health and social services to Project workers at the construction camps.

The Labrador-Grenfell Regional Health Authority stated that the regional health centre in Happy Valley-Goose Bay did not have the resources to address existing health and addictions needs in the communities. Both Nalcor and the Province agreed that it was the provincial government's responsibility to address any service shortfall, though the Panel also heard other views.

Participants also expressed concerns that the Project could result in people moving away permanently from coastal communities because of the challenges associated with travel, new employment opportunities opening up in Happy Valley-Goose Bay, or simply wanting to take advantage of services and recreational opportunities in a larger centre.

The Panel concluded that in-migration levels would exceed Nalcor's predictions as people moved into the community to fill job openings caused by people leaving to take higher-paid employment with the Project. The Panel therefore recommended that the provincial Department of Health and Community Services make a formal commitment to provide the human resources to address any Project-related increase in demand for mental health, addictions and other health and social services, with financial contributions from Nalcor as required.

Community Infrastructure

Nalcor indicated that the Project would require use of infrastructure within the community of Happy Valley-Goose Bay, mainly during the construction period, including roads, the landfill site, the port, the airport and industrial and commercial land. Nalcor committed to work with the Town of Happy Valley-Goose Bay on planning and infrastructure issues but, since the Project would be located outside town boundaries, it would not be making payments to the Town by way of taxes or grants in lieu. The Town told the Panel that, while there was enough infrastructure capacity to deal with existing demand, Project-related increases would be problematic and the Town's budget was not sufficient to address the issue.

The Panel noted that several provincial government departments have a role in ensuring that the increased need for infrastructure and municipal services is met. The Panel also recommended that the Province and Nalcor negotiate a capacity agreement with the Town to provide financial resources to increase the Town's capacity to respond to additional administrative demand.

Many participants expressed concerns regarding the existing housing shortage in Happy Valley-Goose Bay, and particularly the resulting pressures on low-income families. The private market might not fully respond to what could be a fairly short-term "housing boom". A number of participants suggested that the unused housing stock at 5 Wing Goose Bay Military Base could provide a solution.

The Panel concluded that the Project and higher than predicted levels of in-migration would have adverse effects on the availability of low-income housing in Happy Valley-Goose Bay. The Panel therefore recommended that the Town of Happy Valley-Goose Bay, supported by Nalcor and relevant government departments and housing agencies, develop a low-income housing strategy with measurable targets.

Human Health, Country Food and Mercury

The consumption of country food contaminated with methylmercury poses risks to human health, particularly in pregnant women and young children. Consumption advisories may effectively mitigate this risk by dissuading people from eating certain food from certain sources, but can also have the effect of reducing confidence in all country food, which can also lead to negative health effects.

Nalcor predicted that consumption advisories would likely apply to fish caught in the main stem of the Churchill River, but not downstream in Goose Bay and Lake Melville. Through the course of the review, the Panel concluded that this prediction was less certain, because of new information regarding the downstream extent of mercury impacts from the Churchill Falls project and concerns raised about the lack of baseline information on existing mercury body burdens. The Panel recommended further assessment of this issue and concluded that consumption advisories, if required in Goose Bay and Lake Melville as a result of elevated mercury in fish or seal, would constitute significant adverse effects on the residents of the Upper Lake Melville communities and Rigolet. The Panel did not make a similar determination for the main stem of the river because of evidence that few people currently fish there.

As a result, the Panel also recommended that Nalcor be required to enter into negotiations with parties representing resource users in Goose Bay and Lake Melville regarding further mitigation, where possible, or compensation measures, including financial redress if necessary, should consumption advisories be required in this area.

The Panel made related recommendations regarding implementation of consumption advisories, monitoring of human health and mercury, country food dietary surveys and research about mercury in a complete range of country food.

Panel Observations on Other Key Community Concerns

The Panel noted a number of additional concerns emerging from evidence provided at community hearings and has made some observations for the information of government decision makers on the following issues:

- electrical power for communities on the coast;

- disparity in financial benefits;
- Churchill Falls redress; and
- consultation with Aboriginal communities.

ACCIDENTS AND MALFUNCTIONS

Participants' main concern was with the possibility and outcome of a major dam failure which could be caused by water overtopping a dam because of an extreme weather event or by a breach in the dam structure.

A dam failure at Muskrat Falls would result in a warning time of approximately two hours, which Nalcor said would be sufficient to avoid loss of life. A dam failure at Gull Island would result in longer warning time and would likely trigger a failure at Muskrat Falls. A failure at the Smallwood Reservoir, which would likely trigger failures of the dams downstream, would have a considerably longer warning time. Dam failure would result in complete inundation of Mud Lake and partial inundation of the lower areas of Happy Valley-Goose Bay. Should that occur, Nalcor predicted economic losses in the order of \$250 million for property in the communities and over \$6 billion for loss of Nalcor's own infrastructure.

Nalcor indicated that the dams would be designed and constructed according to the current standards of the Canadian Dam Association and that it would ensure that the appropriate preventive and mitigation measures, including Emergency Preparedness and Emergency Response Plans, are implemented.

Participants expressed concern about the resources required to prepare effective warning and evacuation strategies, about potential financial losses should a dam failure occur, and the stress of ongoing worry about such an event.

The Panel concluded that dam failure would result in significant adverse effects but would be unlikely to occur. The Panel recommended, however, that Nalcor should assume liability for all personal and financial losses that would be incurred downstream in the unlikely event that one or more dams failed, regardless of the specific cause.

ENVIRONMENTAL MANAGEMENT

Environmental management issues – mitigation, monitoring, follow-up, adaptive management and community and regulatory oversight – were discussed throughout the EIS and the review process. Nalcor made extensive mitigation and monitoring commitments, as listed in the full report. Participants raised concerns regarding Aboriginal and stakeholder involvement, reporting, financial commitments, both by Nalcor and other parties involved in monitoring, and adherence to terms and conditions attached to release from the environmental assessment.

The Panel made a number of recommendations regarding:

- an authorizing regulation that would list all environmental management commitments and require Nalcor and relevant provincial government departments to implement them;
- a joint federal-provincial regulatory plan, with annual reporting on compliance;
- long-term funding commitments for environmental management from Nalcor and the provincial and federal governments;
- a monitoring and community liaison committee, appointed by the Province, with sufficient resources to provide oversight of mitigation and monitoring;
- how monitoring and adaptive management should be carried out; and

- a complaints resolution process.

In addition, the Panel recommended that, should construction of the second generation facility be delayed beyond a certain length of time, the environmental release should expire, and an additional environmental review be required.

Decommissioning

Nalcor stated that it had no plans to decommission the Project; components would be refurbished as required to continue operation. Should decommissioning be required at some point in the future, the environmental impacts and mitigation requirements would be assessed at that time. Nalcor noted that decommissioning would have substantial environmental implications, particularly relating to the possible release of sediments downstream and reconfiguration of the river shorelines.

The Panel concluded that Nalcor should take responsibility for the possibility of decommissioning and recommended that Nalcor be required to demonstrate how it would do this – this could include insurance, a bond or creation of a dedicated fund.

CUMULATIVE EFFECTS

The Panel concluded that Nalcor's approach to cumulative effects assessment was less than comprehensive and that participants had raised valid concerns that contributed to a broader understanding of the potential cumulative effects of the Project. The Panel recognized the challenges involved, including limited information about past projects such as the Churchill Falls project, and the built-in disincentive for proponents to identify adverse cumulative effects when they are perceived as a potential threat to project approval.

The Panel recommended that government agencies support regional processes to ensure a broader based, more integrated approach to cumulative effects assessment, and also that the Province move ahead with the Protected Areas Strategy to increase the percentage of land under protection in Labrador, with the goal of eventually reaching 10 to 15 percent of Labrador's total area, defined by the Strategy as the desirable amount for adequate conservation purposes.

PANEL'S CONCLUDING COMMENTS

The Panel offered concluding comments to help government decision makers with the task of determining whether the Project would make an overall contribution to sustainability. The Panel was guided by the following principle:

The effects, risks and uncertainties of the Project should be fairly distributed among affected communities, jurisdictions and generations, and the Project should result in net environmental, social and economic benefits.

When trying to determine if there would be net benefits, the Panel looked at the residual adverse effects and the predicted Project benefits separately for biophysical issues and socio-economic issues. In other words, the Panel did not make the assumption that adverse biophysical effects could be automatically compensated by economic benefits.

The Panel asked seven questions:

Would there be net economic benefits?

Positive benefits would include employment and business benefits, particularly during construction, and – for Innu Nation – the revenues and business opportunities associated with the *Tshash Petapen* Agreement. Other long-term economic opportunities would include those related to increased business capacity, a training legacy, additional lower-cost power in Labrador, energy security and price stability, and provincial revenues for the life of the Project. Uncertainties and risks related to the viability of the Muskrat Falls component and market access uncertainties for Gull Island and the effect of both on long-term benefits. The Panel made recommendations to address and resolve these uncertainties. Once the required further financial assessments have been carried out, decision makers would be able to determine whether the Project, under the various scenarios contemplated by Nalcor, would have a net economic benefit and at what scale. If the whole Project proceeds, the Panel had reasonable confidence that the adverse economic effects and risks would be outweighed by the potential for large-scale economic benefits.

Would there be net social and cultural benefits?

Benefits would include training, employment and increased incomes during construction. Adverse effects would include the risk of increased drug and alcohol problems and their effects on families, the effects of the housing shortage, possible inflation of the cost of goods and services, changes to country food and traditional activities, and loss of valued cultural sites, including the “loss of the river”. The Panel noted that information on current land and resource use by some Aboriginal groups is not yet complete. Other uncertainties included whether and how mitigation would be carried out, and how individuals and community leaders choose to respond to the Project. The Panel concluded that it is possible but uncertain whether the Project as proposed by Nalcor would result in net social benefits. However, there are clearly opportunities to enhance this possibility.

Would there be net biophysical benefits?

Biophysical benefits would mainly derive from the greenhouse gases displaced by sale of the Project’s renewable power. The Panel did not have sufficient information to know exactly how large this effect would be but made recommendations as to how it could be maximized. The adverse biophysical effects would include – among others – the loss of fish, riparian, wetland and terrestrial habitat, and the risk to the Red Wine Mountain caribou herd. The Panel acknowledged the difficulty of comparing a benefit that accrues at a much wider, North American (and potentially global) scale with adverse effects that are experienced locally in Labrador. The Panel concluded the Project would not result in net biophysical benefits, although it is possible that the adverse effects could be offset to a certain extent by a commitment to permanently protect other land and rivers in Labrador.

Would there be net benefits to future generations?

Future benefits would include energy security (although in the context of Newfoundland and Labrador, this is already assured by the availability of Churchill Falls power in 2041), and potentially long-term provincial revenues. Innu Nation would also realize long-term financial benefits. Adverse future effects would include the “loss of the river” and cultural sites, and also the risk that some of the predictions about Project effects may turn out to be inaccurate. The Panel concluded that there is uncertainty regarding this question.

Would there be net benefits to Newfoundland and Labrador?

The Panel concluded that the Project might deliver net economic benefits to the Province as a whole, depending on the results of the recommended studies regarding long-term benefits and alternatives. The residual environmental effect for Labrador would likely be adverse. Whether there would be net social and economic benefits for Labrador would depend on whether enough of the revenues generated by the Project were re-invested in Labrador.

Would there be net benefits beyond Newfoundland and Labrador?

Overall, the Panel believed that there would be net benefits beyond the province in the form of employment and business opportunities, greenhouse gas reduction, and energy stability. Adverse effects might be experienced to a certain degree by Aboriginal communities in Quebec.

Would there be net benefits to individual communities?

Happy Valley-Goose Bay would experience a range of effects, positive and negative. On balance, with appropriate mitigation, the Panel concluded that net benefits would result.

In Sheshatshiu, the situation would be complex and uncertain. The *Tshash Petapen* Agreement would clearly deliver many resources and opportunities, including increased self-government. On the other hand, the Panel was told of the many social and cultural challenges in the community. On balance, the Panel believed net benefits are possible in Sheshatshiu.

In Mud Lake, North West River and Rigolet, net benefits appear less likely. Whether the overall effect would be neutral or adverse, would depend on the degree to which residents obtain employment and whether downstream consumption advisories are required. Mud Lake would also be more vulnerable to adverse Project effects on transportation across the river, and the risk of a dam failure event, even if very unlikely. The Panel concluded the effect in Nain and Cartwright would likely be neutral, with some opportunities but also some risk of out-migration.

The Panel concluded that the Project would be unlikely to deliver benefits to Aboriginal communities in Quebec. The Panel was unable to determine whether there would be adverse effects on land and resource use or rights and title. This should be addressed through ongoing government consultation.

Concluding Thoughts on the Final Project Decision

The Panel concluded that if the recommended economic and alternatives studies show that there are alternative ways of meeting the electricity demands of the Island over the medium term in a manner that is economically viable and environmentally and socially responsible, the Muskrat Falls portion of the Project should likely not be permitted to proceed for purposes of meeting Island demand.

If market access for Gull Island were resolved based on reasonable transmission costs and the Gull Island facility were to be developed first, or a joint sanction decision were to be made, the Panel believed the situation would be different. The Gull Island facility would produce more power at a lower unit cost and therefore would offer much greater potential to provide lower cost power to Newfoundland and Labrador and generate revenues for the Province.

The effect of the Project on Aboriginal rights and title as well as the effect on current land and resource use by Aboriginal communities has yet to be fully understood and agreements have yet to be reached with affected communities on how any impacts would be addressed. These

issues could be addressed together in the context of the *Federal Aboriginal Consultation Framework for the Lower Churchill Hydroelectric Generation Project*.

Finally, the Panel wants to thank everyone who participated in the review process, including individuals, organizations, government representatives, and Nalcor. Your hard work, persistence, and willingness to share experience, knowledge, ideas and aspirations with the Panel was invaluable. The Panel writes the report but the environmental assessment as a whole is truly a collective effort. It is our hope that all participants in this environmental assessment feel that they have both contributed to the conclusions and recommendations reached and have learned from other participants during the course of the process.

1 INTRODUCTION

Nalcor Energy (Nalcor) has proposed to develop two hydroelectric generation facilities, including construction of associated dams and reservoirs, on the lower Churchill River in central Labrador. The generation facilities would have a combined capacity of 3,074 megawatts (MW) with one facility located at Gull Island (2,250 MW) and one at Muskrat Falls (824 MW). The Project would also include transmission lines between Muskrat Falls and Gull Island and between Gull Island and the existing Churchill Falls facility. Additional facilities associated with the Project would include access roads, temporary bridges, construction camps, borrow pits and quarry sites, diversion facilities and spoil areas.

This report presents the results of the Joint Review Panel's (the Panel) examination of the potential environmental effects of the Lower Churchill Hydroelectric Generation Project (the Project) proposed by Nalcor. The Panel is satisfied that it has complied with its Terms of Reference and has gathered sufficient information to form conclusions on the potential environmental effects of the Project, and, where appropriate, to make recommendations regarding management of those effects, should the Project proceed.

1.1 REGULATORY AND LEGISLATIVE CONTEXT

On November 30, 2006, Newfoundland and Labrador Hydro, now Nalcor Energy, submitted a project registration/project description document for the Project to the Government of Newfoundland and Labrador and the Government of Canada. In January 2007, the Newfoundland and Labrador Minister of Environment and Conservation advised Newfoundland and Labrador Hydro that the Project was subject to the *Environmental Protection Act* and that an environmental impact statement (EIS) was required. The Newfoundland and Labrador Minister of Environment and Conservation also recommended to the Lieutenant-Governor in Council that a public hearing be held for the Project.

In February 2007, Transport Canada and Fisheries and Oceans Canada determined that an environmental assessment was required under the *Canadian Environmental Assessment Act* because the Project would be subject to formal approval under subsection 5(1) of the *Navigable Waters Protection Act* and would require an authorization under Subsection 35(2) of the *Fisheries Act* to enable it to proceed. They advised that they would be responsible authorities for the environmental assessment of the Project. Environment Canada, Health Canada, Natural Resources Canada, and Aboriginal Affairs and Northern Development Canada indicated that they had expertise relevant to the environmental assessment of the Project. Transport Canada and Fisheries and Oceans Canada also determined that the Project had the potential to cause significant adverse environmental effects even with the implementation of mitigation measures, and that there were public and Aboriginal concerns that warranted referral to a federal review panel.

As a result, the Governments of Newfoundland and Labrador and Canada agreed to an environmental assessment by a joint review panel to ensure that the type and quality of information and conclusions on environmental effects required to satisfy their respective legislative requirements were produced through a single, effective and efficient environmental assessment process.

1.2 EIS GUIDELINES

In December 2007, the Newfoundland and Labrador Department of Environment and Conservation and the Canadian Environmental Assessment Agency released draft guidelines (herein referred to as the EIS Guidelines) for the preparation of an environmental impact statement for the Project. The draft EIS Guidelines were subject to a public consultation from December 19, 2007 to February 27, 2008. After consideration of the comments received, the Newfoundland and Labrador Minister of Environment and Conservation and the federal Minister of the Environment finalized and issued the EIS Guidelines to Nalcor. The provincial and federal governments developed these Guidelines to guide Nalcor in preparing an environmental impact statement that would satisfy the legislative requirements of both governments.

1.3 JOINT REVIEW PANEL

1.3.1 Joint Review Panel Agreement and Terms of Reference

In June 2008, the Newfoundland and Labrador Department of Environment and Conservation and the Canadian Environmental Assessment Agency invited the public to comment on a draft Agreement and Terms of Reference for the establishment of a five-member joint review panel and procedures for conducting the review. In particular, the Terms of Reference defined the mandate of the Panel and the scope of the environmental assessment.

The Newfoundland and Labrador Minister of Environment and Conservation and Minister for Intergovernmental Affairs and the federal Minister of the Environment finalized and released the Agreement and Terms of Reference in January 2009. At the request of the Panel, the Agreement and Terms of Reference were subsequently amended to extend the consultation period for Aboriginal groups to comment on the EIS, and to provide more flexibility for translating Panel documents, particularly information requests. A copy of the Agreement and Terms of Reference is included in Appendix 2.

1.3.2 Panel Mandate

The Panel derived its mandate from the Newfoundland and Labrador *Environmental Protection Act*, the *Canadian Environmental Assessment Act* and its Terms of Reference. In general terms, the Panel was mandated to determine whether the Project, considering mitigation measures, was likely to cause significant adverse environmental effects. In making this determination, the Panel was also required to consider the need, purpose and rationale for the Project, alternative means of carrying out the Project and alternatives to it, among other matters. For the purposes of the Panel's mandate, the environment was broadly defined and included socio-economic impacts. Upon conclusion of the review process, the Panel prepared this report setting out its conclusions and recommendations relating to the environmental effects of the Project.

The Panel also had the mandate to invite information from Aboriginal groups and people related to the nature and scope of potential or established Aboriginal rights or titles in the area of the Project, as well as information on the potential adverse impacts or potential infringement that the Project could have on asserted or established Aboriginal rights or titles. The Panel was also required to include information related to traditional use of lands and resources, strength of claim, and any concerns as they relate to potential environmental effects of the Project. However, the Panel did not have a mandate to make any determinations or interpretations regarding the following:

- the validity or the strength of any Aboriginal group's claim to aboriginal rights and titles or treaty rights;

- the scope or nature of the Crown's duty to consult Aboriginal persons or groups;
- whether Canada or Newfoundland and Labrador has met its respective duty to consult and accommodate in respect of potential rights recognized and affirmed by s. 35 of the *Constitution Act, 1982*; and
- the scope, nature or meaning of the *Labrador Inuit Land Claims Agreement*.

In August 2010, the Canadian Environmental Assessment Agency released the *Federal Aboriginal Consultation Framework for the Lower Churchill Hydroelectric Generation Project* (the Framework) to clarify how the federal government would rely on the Panel review process in fulfilling its legal duty to consult Aboriginal groups. The Framework clarified the role of the Canadian Environmental Assessment Agency and federal departments in consultation activities during the Panel review process as well as consultation activities outside the Panel process.

The Framework identified the importance of the Panel review process within overall federal government consultation activities and the importance of Aboriginal participation in that process. The Framework also pointed out that the Panel report and records established through the Panel review would be the primary source of information to support the federal government assessment of potential impacts of the Project on potential and established Aboriginal and treaty rights.

1.3.3 Panel Membership

The Panel was appointed on January 8, 2009 and consisted of Ms. Lesley Griffiths and Mr. Herbert Clarke as Co-Chairs and Dr. Meinhard Doelle, Dr. Keith Chaulk and Mr. James Igloliorte as Panel members. On March 2, 2010, Dr. Keith Chaulk resigned and Ms. Catherine Jong was appointed. Biographical notes are included in Appendix 3.

1.4 INVOLVEMENT OF INTERESTED PARTIES

1.4.1 Opportunities for Participation

The federal and provincial governments, the Panel and Nalcor all provided opportunities for public participation throughout the environmental assessment process. The Canadian Environmental Assessment Registry internet site for the Project allowed the public to access all documents associated with the environmental assessment. Interested parties were notified when documents were posted to the Registry, including those submitted by Nalcor, and were invited to comment on these documents. The Panel also requested comments from participants on Panel documents and procedures such as the document translation process, hearing schedule, hearing locations and hearing procedures. The Panel held a public hearing during March and April 2011. Additional information on the hearing is provided in Section 1.7 below and in Appendices 4, 5 and 6.

1.4.2 Participant Funding Program

Pursuant to subsection 58(1.1) of the *Canadian Environmental Assessment Act*, participant funding was made available to help the public and Aboriginal groups participate in the environmental assessment of the Project. The Participant Funding Program consisted of two funding envelopes: the regular funding envelope and the Aboriginal funding envelope. Funding was available to help participants review the draft EIS Guidelines and the EIS and to participate in the public hearing.

The Canadian Environmental Assessment Agency established Funding Review Committees, independent from the Panel, to review funding applications and to recommend funding allocations. In total, the Canadian Environmental Assessment Agency allocated funding to the following applicants:

- Council of the Innu of Unamen Shipu and Council of the Innu of Pakua Shipu: \$106,875;
- *Corporation Nishipimian* (Council of the Innu of Ekuanitshit): \$55,850.25;
- *Fiducie Takuaikan* (Nutashkuan First Nation): \$46,000;
- Grand RiverKeeper Labrador Inc.: \$77,600;
- Innu Nation: \$533,968;
- Labrador Métis Nation (now the NunatuKavut Community Council): \$133,000;
- Naskapi Nation of Kawawachikamach: \$9,165;
- Natural History Society of Newfoundland and Labrador: \$16,400;
- Nunatsiavut Government \$23,471;
- Sierra Club Canada - Atlantic Chapter: \$50,000; and
- Women in Resource Development: \$5,000.

The Canadian Environmental Assessment Agency will make additional funding available under the Aboriginal funding envelope for the participation of Aboriginal groups in consultation activities related to the Panel report.

1.5 SITE VISIT

On August 17, 2009, the Panel notified participants of its intention to conduct a site visit of the Project area on its own, without the presence of Nalcor or any other interested party. In September 2009, the Panel and Secretariat visited the proposed Project area. The Panel traveled over the full length of the Churchill River (and parts of major tributaries) by helicopter from its mouth to Churchill Falls. The Panel visited the proposed locations of the Muskrat Falls and Gull Island generation facilities, the proposed Gull Island accommodations site, and the existing Churchill Falls Power Station. The Panel also viewed the Goose Bay port facilities, the Churchill River estuary, Mud Lake, the rock knoll at Muskrat Falls, Lake Winokapau, the Twin Falls facility, the eastern portion of the Smallwood Reservoir, existing access roads, the Trans Labrador Highway, and along the proposed route for the interconnecting transmission lines.

1.6 DETERMINATION OF EIS SUFFICIENCY

The Panel was required to determine whether the EIS submitted by Nalcor contained sufficient information to proceed to public hearing. In order to make this determination, the Panel solicited comments from participants on the EIS and requested additional information from Nalcor.

The steps taken by the Panel to determine sufficiency included the following:

- reviewing the EIS and issuing several rounds of information requests;
- encouraging public participation in the review of the EIS and in Nalcor's responses to information requests;
- reviewing Nalcor's responses to information requests and comments received from the public on these responses; and
- requesting clarification on information requests submitted by Nalcor and on comments submitted by participants.

On January 14, 2011, the Panel determined that the EIS and additional information provided by Nalcor contained sufficient information to proceed to public hearing. At the same time, the Panel announced that the hearing would begin on March 3, 2011.

1.7 PUBLIC HEARING

The Panel held its public hearing from March 3 to April 15, 2011 in several Labrador communities, St. John's and Sept-Iles (30 hearing days over 44 calendar days). The full hearing schedule, showing the locations of the hearing, is included in Appendix 4. The Panel held three types of hearing sessions: general, community and topic-specific.

At general sessions, participants were invited to make presentations on any aspect of the Project within the scope of the review.

Community sessions were designed to encourage the full and open participation of people living near the location of the Project. Priority to present at these sessions was given to people and organizations from each community. In addition, the Panel encouraged Aboriginal people and groups to provide information at these sessions on asserted or established Aboriginal rights or titles, traditional use of lands and resources, strength of claim and any concerns related to the Project. Summaries of what the Panel heard at each of these sessions are included in Appendix 5.

Topic-specific sessions were designed to receive information on the following topics related to the review: Need, Purpose and Alternatives, Economic Impacts, Reservoir Preparation, Aquatic Environment, Terrestrial Environment, Social and Cultural Impacts, Environmental Management, Monitoring and Follow-up and Cross-Cutting Issues.

Closing Remarks were presented on April 14 and 15, 2011 in Happy Valley-Goose Bay.

The Panel heard over 230 hearing presentations during the hearing. A list of participants who appeared before the Panel is included in Appendix 6.

2 PROJECT SETTING AND DESCRIPTION

Nalcor Energy has proposed the construction of two hydroelectric generating facilities on the Churchill River, at Gull Island and Muskrat Falls, in central Labrador. Nalcor is the parent company of Newfoundland and Labrador Hydro, the Churchill Falls (Labrador) Corporation and the Oil and Gas Corporation of Newfoundland and Labrador.

Gull Island and Muskrat Falls would be subject to separate sanction decisions by Nalcor. Nalcor's preferred sequencing would be to construct the Muskrat Falls facility first, followed by the Gull Island facility with an overlap in construction.

The proposed Project would have a total generating capacity of 3,074 MW and would include interconnecting transmission lines to the existing Churchill Falls Power Station. The total capital cost of the Project has been estimated at \$6.4 billion (in 2010 dollars). According to Nalcor, during the eleven-year construction phase, the Project would create nearly 16,000 person years of direct employment in the province, most of which would be located in Labrador. In addition, the Project would result in \$2.1 billion in income to Newfoundland and Labrador labour and business, of which \$0.7 billion would accrue to Labrador. Nalcor has estimated that the Project would result in \$340 million (in 2010 dollars) in tax revenue to the Government of Newfoundland and Labrador during construction, with an additional \$1 billion in direct revenues each year after debt obligations have been paid. When operational, the Project would create approximately 80 direct and 200 indirect and induced jobs annually.

2.1 PROJECT BACKGROUND

In 1974, the Churchill Falls Power Station was completed and planning began for further development of the Churchill River. The Churchill Falls project has a rated capacity of 5,428 MW and harnesses about 65 percent of the potential generating capacity of the river. Since 1974, extensive fieldwork and engineering studies have been conducted on developing the remaining hydroelectric potential of the lower reaches of the Churchill River.

In 1980, a panel review of a Lower Churchill development proposal was conducted under the Federal Environmental Assessment and Review Process, and in accordance with the requirements of the Government of Newfoundland and Labrador. That project involved placing dams and generating facilities at Muskrat Falls and Gull Island. The project was released from the assessment with conditions in December 1980, but did not proceed.

Renewed efforts to develop the lower Churchill began again in 1990 and resulted in registration of a project in 1991 in accordance with the *Newfoundland Environmental Assessment Act*. While a review of existing information was conducted at that time, no new baseline studies were undertaken and the project did not proceed due to market conditions.

From 1998 to 2001, further work was done on developing the lower Churchill, which resulted in thirty-five baseline studies being conducted. Again, financial and market conditions were not favorable to the development of the project.

On November 30, 2006, Newfoundland and Labrador Hydro registered this Project for assessment under the provincial and federal environmental assessment processes. That registration initiated the current environmental assessment.

2.2 PROJECT SETTING

The Project would be located in central Labrador, in the lower Churchill River watershed. The Muskrat Falls and Gull Island facilities would be approximately 30 and 100 kilometres southwest of Happy Valley-Goose Bay, respectively.

Together, the upper and lower Churchill River watersheds cover an area of 92,355 square kilometres, extending from Lake Melville in the east to beyond the Smallwood Reservoir in the west. The Churchill River flows into Goose Bay before entering Lake Melville, which flows into the Labrador Sea (see Figure 1).

The existing Churchill Falls Power Station, owned and operated by Churchill Falls (Labrador) Corporation Limited, is located near the centre of the Churchill River watershed. The facility consists of 11 turbines in underground powerhouses; the total generating capacity of the Churchill Falls Power Station is 5,428 MW. Water for the facility is stored in the Smallwood Reservoir, which is located on the Labrador Plateau and covers 6,988 square kilometres. The Smallwood Reservoir has a drainage area of approximately 71,700 square kilometres, which includes the upper Churchill River as well as portions of the Naskaupi and Kanairiktok rivers. The reservoir has a live storage capacity of 30 billion cubic metres – enough to allow the entire spring runoff to be stored in the reservoir. The Churchill Falls Power Station regulates the drainage from over 75 percent of the total watershed area and has reduced the natural flow variability of the lower Churchill River. The current flow through the Churchill Falls Power Station is generally maintained at approximately 1,400 cubic metres per second. As a result, compared to natural conditions, existing flows in the Churchill River are generally higher in the winter and lower in late spring and summer.

Nalcor noted that the Lower Churchill Project would primarily utilize the existing storage capacity of the Smallwood Reservoir and would have little storage capacity of its own. The Project would flood 126 square kilometres versus the 2500 square kilometres of land flooded for the Smallwood Reservoir. Nalcor also pointed out that both the Muskrat Falls and Gull Island reservoirs would be deep and narrow compared to other large hydroelectric facilities in Canada and elsewhere, resulting in lower emissions of greenhouse gasses over their lifetimes.

2.3 PROJECT COMPONENTS

Each generation facility would consist of a concrete dam, reservoir and powerhouse. Interconnecting transmission lines would be erected to connect both facilities to Churchill Falls. Both dams would be constructed to Canadian Dam Association standards. During construction, accommodation complexes would be provided at or near each site.

A Water Management Agreement was imposed by the Newfoundland and Labrador Public Utilities Board in March 2010 and would take effect upon completion of the Project. This Agreement, between Nalcor and Churchill Falls (Labrador) Corporation Limited, is required by the provincial Government of Newfoundland and Labrador, under the *Electric Power Control Act 1994* and requires the two companies to manage the water resources of the Churchill River in a manner that will achieve the most efficient production, transmission and distribution of power.

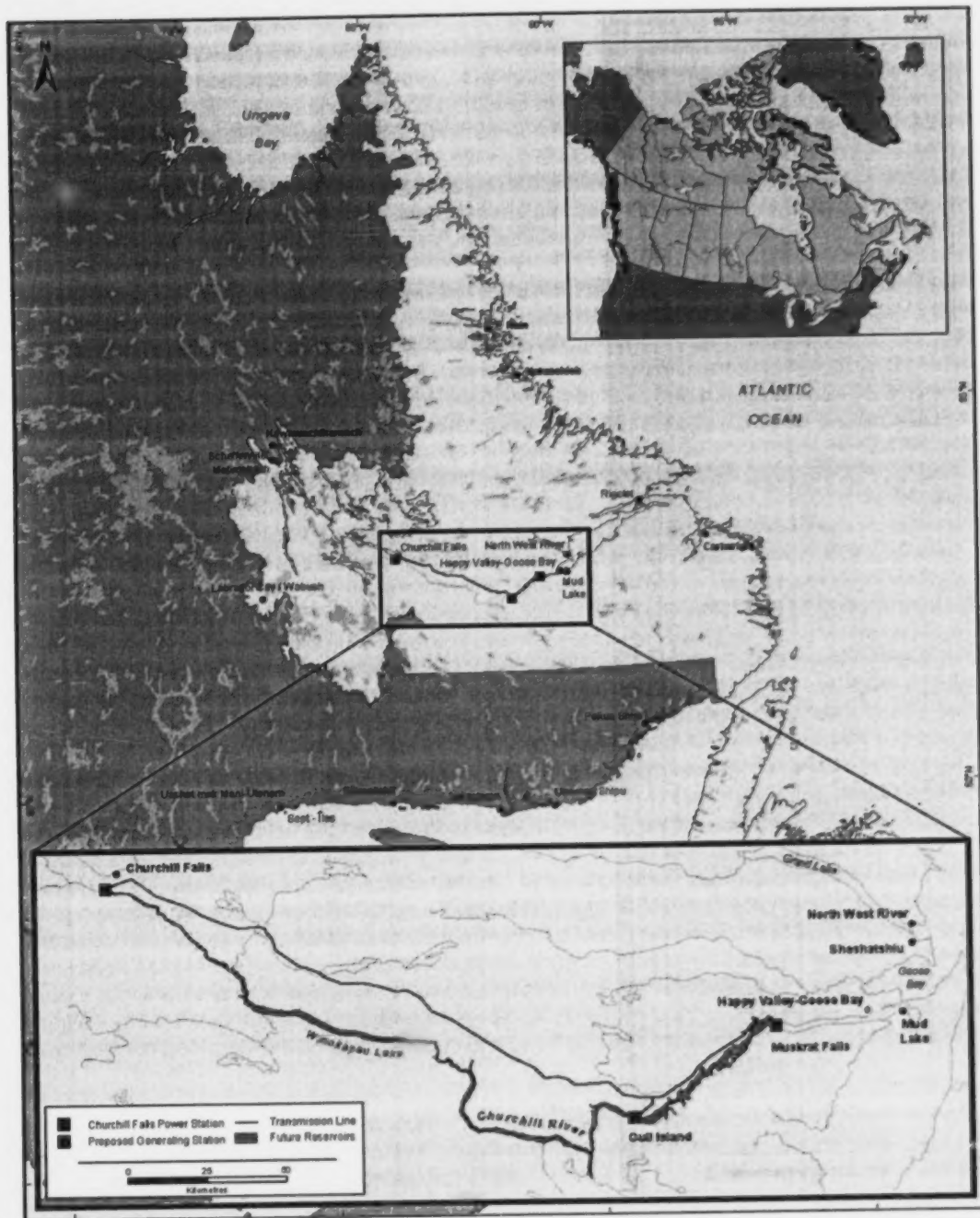


Figure 1. Lower Churchill Hydroelectric Generation Project area (Source: Nalcor)

Muskrat Falls

The Muskrat Falls facility would consist of two dams, a reservoir and a generation facility having a total capacity of 824 MW. The two dams would be constructed of roller compacted concrete. The north dam would be 32 metres high and 432 metres in length, and the south dam would be 29 metres high and 325 metres in length (Figure 2). The north dam would be located near the rock knoll at Muskrat Falls.

The resulting reservoir would be 59 kilometres long and would extend back to the tailrace of the Gull Island facility. The new reservoir would inundate 41 square kilometres of the existing riverbank or shoreline and would have a total surface area of 101 square kilometres. The full supply level of the reservoir would be 39 metres above sea level and the discharge level would be 3 metres above sea level. During operation the reservoir water level would operate at between a low supply level of 38.5 metres and the full supply level of 39 metres above sea level; the net head would be 35 metres. The reservoir would have a live storage capacity of 50 million cubic metres.

The powerhouse would be an above-ground structure that would house four Kaplan turbines, each with a capacity of 206 MW giving a total installed capacity of 824 MW. Water for each turbine would be provided through a 9-metre diameter penstock. The total discharge from the powerhouse would be 2,660 cubic metres per second. The spillway would accommodate a probable maximum flood of 22,420 cubic metres per second.

An accommodation complex would be located on the south side of the Churchill River near the work site. Occupancy would range from 500 persons in the first year of construction to a planned peak of approximately 1,000. In addition to the site accommodation facilities, available housing in Happy Valley-Goose Bay might be used for some long-term Project personnel. The accommodations facility would mainly consist of single rooms. Short-term workers would use double occupancy rooms. The accommodations would be a two-storey configuration constructed of modular trailer units. The camp would have a dining room with a 350-person seating capacity and a kitchen designed to service up to 1,000. In addition to these facilities, the camp would also have a coffee shop, bank machines, commissary, recreation facilities, satellite TV and security systems. The site would also have a medical clinic, a post office and administrative offices.

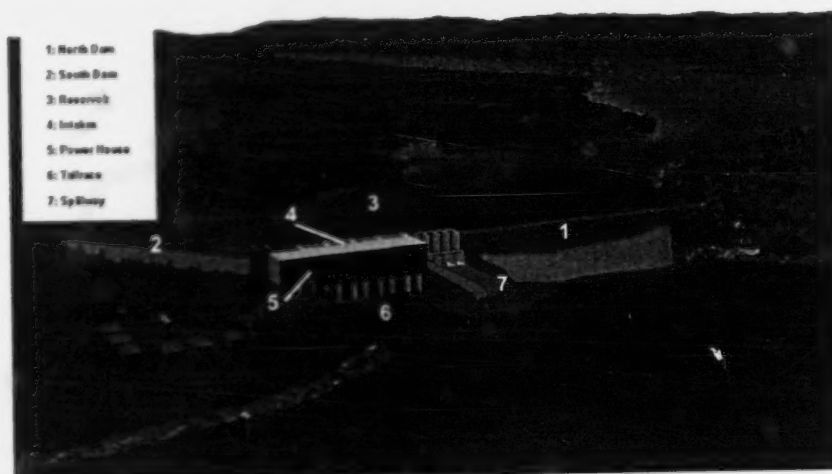


Figure 2. Muskrat Falls Generation Facility – conceptual illustration (Source: Nalcor)

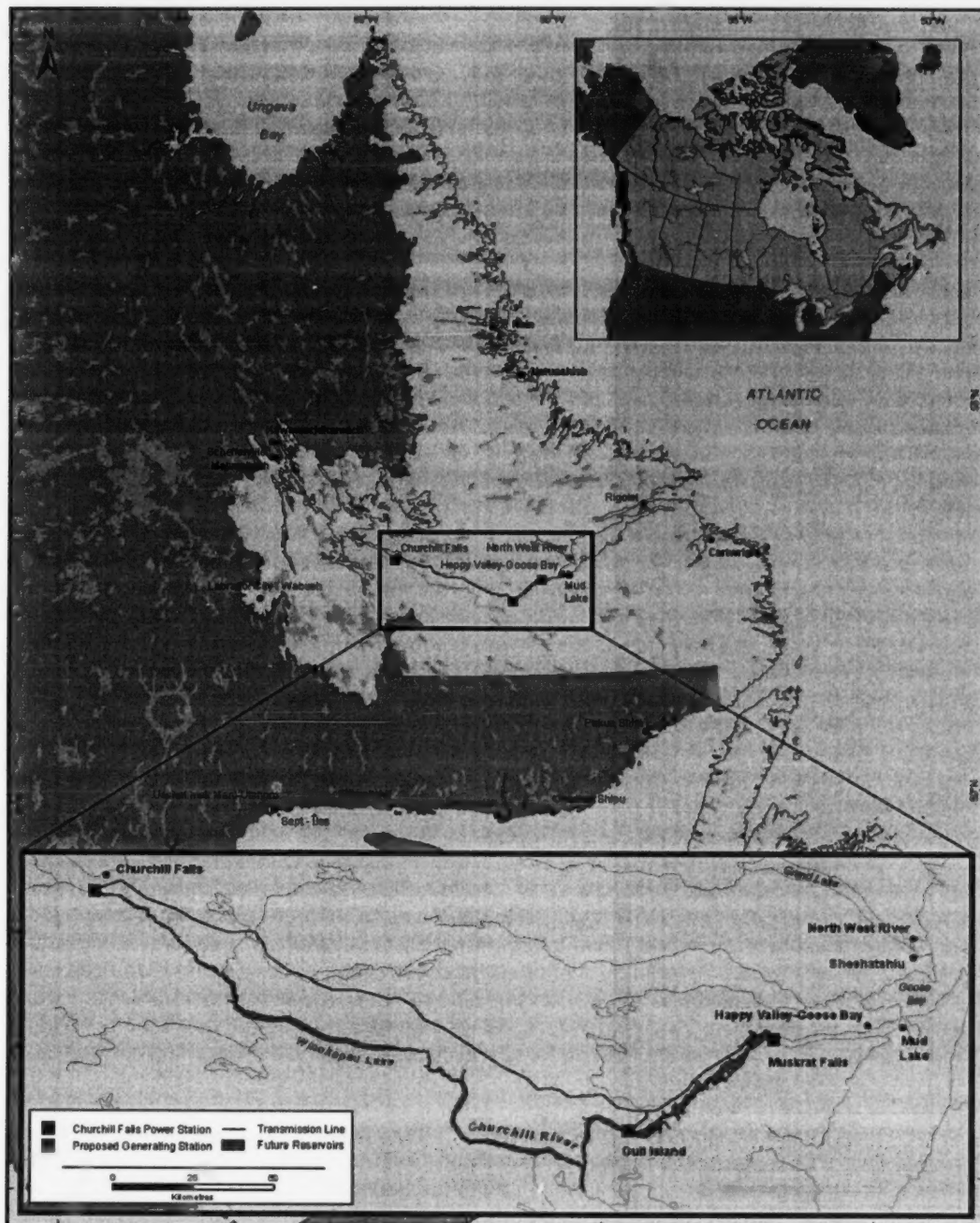


Figure 1. Lower Churchill Hydroelectric Generation Project area (Source: Nalcor)

Muskrat Falls

The Muskrat Falls facility would consist of two dams, a reservoir and a generation facility having a total capacity of 824 MW. The two dams would be constructed of roller compacted concrete. The north dam would be 32 metres high and 432 metres in length, and the south dam would be 29 metres high and 325 metres in length (Figure 2). The north dam would be located near the rock knoll at Muskrat Falls.

The resulting reservoir would be 59 kilometres long and would extend back to the tailrace of the Gull Island facility. The new reservoir would inundate 41 square kilometres of the existing riverbank or shoreline and would have a total surface area of 101 square kilometres. The full supply level of the reservoir would be 39 metres above sea level and the discharge level would be 3 metres above sea level. During operation the reservoir water level would operate at between a low supply level of 38.5 metres and the full supply level of 39 metres above sea level; the net head would be 35 metres. The reservoir would have a live storage capacity of 50 million cubic metres.

The powerhouse would be an above-ground structure that would house four Kaplan turbines, each with a capacity of 206 MW giving a total installed capacity of 824 MW. Water for each turbine would be provided through a 9-metre diameter penstock. The total discharge from the powerhouse would be 2,660 cubic metres per second. The spillway would accommodate a probable maximum flood of 22,420 cubic metres per second.

An accommodation complex would be located on the south side of the Churchill River near the work site. Occupancy would range from 500 persons in the first year of construction to a planned peak of approximately 1,000. In addition to the site accommodation facilities, available housing in Happy Valley-Goose Bay might be used for some long-term Project personnel. The accommodations facility would mainly consist of single rooms. Short-term workers would use double occupancy rooms. The accommodations would be a two-storey configuration constructed of modular trailer units. The camp would have a dining room with a 350-person seating capacity and a kitchen designed to service up to 1,000. In addition to these facilities, the camp would also have a coffee shop, bank machines, commissary, recreation facilities, satellite TV and security systems. The site would also have a medical clinic, a post office and administrative offices.



Figure 2. Muskrat Falls Generation Facility – conceptual illustration (Source: Nalcor)

Gull Island

At Gull Island, a concrete faced rock filled dam, 99 metres high and 1,315 metres in length would be constructed across the Churchill River (Figure 3). The resulting reservoir would be 232 kilometres long and would extend back to the tailrace of the Churchill Falls facility. The new reservoir would inundate 85 square kilometres of the existing riverbank and would have a total surface area of 213 square kilometres. The full supply level of the reservoir would be 125 metres above sea level and the discharge level would be 39 metres above sea level. During operation, the reservoir water level would operate between a low supply level of 122 metres and full supply level of 125 metres above sea level. The net head would be 86 metres. The reservoir would have a live storage capacity of 580 million cubic metres.

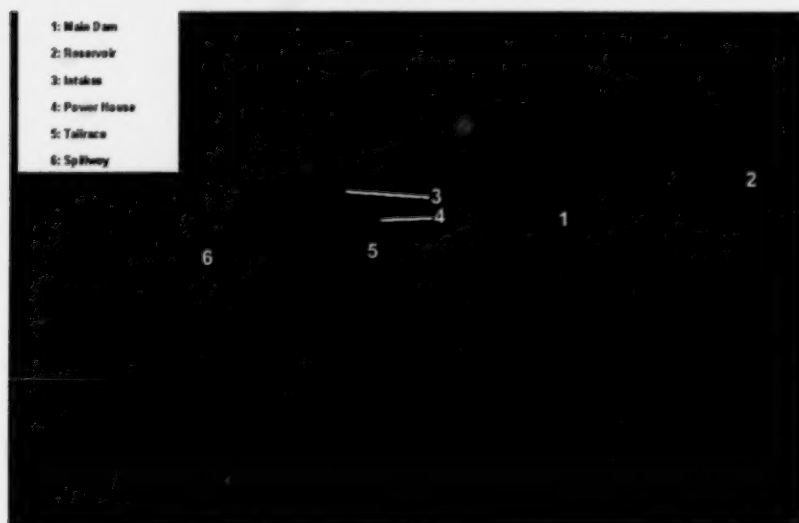


Figure 3. Gull Island Generation Facility – conceptual illustration (Source: Nalcor)

The powerhouse would be an above-ground structure housing five Francis turbines, each with a capacity of 450 MW, giving a total installed capacity of 2,250 MW. Water for each turbine would be provided through a 7.2-metre diameter penstock. The total discharge from the powerhouse would be 2,950 cubic metres per second. Excess water would be spilled through a spillway designed to handle extreme precipitation, spring runoff, maintenance, or emergencies. The spillway would be used infrequently because the design flow capacity of the turbines would be greater than the average flow of water into the reservoir. The spillway would accommodate a probable maximum flood of 20,800 cubic metres per second.

During previous construction activity at the Gull Island site in 1975, a 30-hectare site was cleared for a construction camp. The accommodations complex for the construction of the Gull Island development would be in the same location on the north side of the river. The complex would have a peak capacity of 2,000 workers. The accommodations complex would comprise mainly single rooms. Short-term workers would have access to double occupancy rooms. The accommodations would comprise a two-storey configuration using modular trailer units. The complex would have a dining room with approximately 600 person seating capacity and a kitchen designed to service 2,000. The complex would also have a coffee shop, bank machines, commissary, recreation facilities, satellite TV and security systems. The site would also house a medical clinic, post office and administrative offices.

In addition to the construction camp, a 40-person, self-contained accommodations building would be provided for maintenance staff during major shutdowns and overhauls. The building would include potable and firewater facilities, sewage and waste treatment, and heating, ventilation and air conditioning. The facilities would also be equipped with a kitchen, sleeping quarters, and recreation and laundry rooms.

Interconnecting Transmission Lines

The transmission lines would consist of two 60-kilometre, single circuit, 345-kilovolt lines from Muskrat Falls to Gull Island, strung on lattice steel-type towers approximately 40 metres high, with an average span of 400 metres between towers.

Between Gull Island and Churchill Falls, there would be two 203-kilometre single circuit transmission lines. One would be a single circuit 735-kilovolt standard transmission line with steel lattice towers approximately 50 metres high, with an average span of 500 metres between towers. The other line would be a 345-kilovolt single circuit transmission line, similar to the transmission line between Muskrat Falls and Gull Island.

The transmission lines would generally run parallel to the existing 138-kilovolt transmission line between Happy Valley-Goose Bay and Churchill Falls. The cleared right-of-way would be approximately 100 metres in addition to the existing 20-metre wide right-of-way.

Construction Sequence

Nalcor's preferred construction sequence would begin with Muskrat Falls, followed by construction of Gull Island with a three-year overlap in construction. Construction at Muskrat Falls would begin in year one and would be complete by year seven. Construction at Gull Island would begin in year five and would be complete by year 12. Other construction sequences considered by Nalcor included the original sequence proposed in the EIS, beginning with Gull Island, followed by Muskrat Falls with a four year overlap in construction. Construction at Gull Island would begin in year one, and would take approximately eight years to complete. Construction at Muskrat Falls would begin in year five, and would be complete by year ten. The third construction sequence considered would see the construction of the Muskrat Falls generating facility followed by the construction of the Gull Island facility at an indeterminate time, with no overlap in construction.

Reservoir Preparation

Nalcor has indicated that the reservoirs would be partially cleared of timber using a mechanical harvesting system. The resulting non-merchantable material would be mulched, or broken up mechanically into small pieces and left in place to decompose.

The Project would involve approximately 375 kilometres of new or upgraded roads, both for access to construction sites and for reservoir clearing. For reservoir clearing, four main access roads were planned: one to the mouth of the Minipi River along the south side of the river; two from the Trans Labrador Highway to the mouths of Bob's Brook and Metchin River respectively; and one from the Trans Labrador Highway to the lower end of Lake Winokapau. The planned roads to Minipi River, Bob's Brook and the lower end of Lake Winokapau were identified in the 2009 Reservoir Preparation Plan primarily for debris management purposes. The road to the mouth of the Metchin River would be required for fish habitat site preparation.

Most of these new or upgraded roads would be located within the reservoir flood zone or would be decommissioned when construction activities are completed. Nalcor stated that only 15 to 30

kilometres of access roads would remain permanently accessible at the end of the construction period and that most of them currently exist, such as the access road to the Gull Island facility and a portion of the north access road to the Muskrat Falls facility.

Nalcor noted that impoundment (flooding) of the two reservoirs would begin upon completion of the construction work. Nalcor's preferred timing for impoundment would be August through October, noted as the least sensitive period for aquatic and terrestrial species lifecycles. Impoundment of the Muskrat Falls and Gull Island reservoirs would take approximately 15 and 50 days, respectively.

Operation and Decommissioning

Nalcor indicated that the Gull Island and Muskrat Falls facilities would be operated remotely from Nalcor's Energy Control Centre in St. John's. Maintenance personnel based in Happy Valley-Goose Bay would provide scheduled maintenance and regular monitoring of the sites.

Nalcor indicated that it would refurbish the generating facilities as required to maintain operations and had no plans to decommission the Project.

3 PANEL'S APPROACH

For clarification and report navigation purposes, the Panel takes this opportunity to describe its approach to a number of issues.

Attribution of Information

The Panel has taken the following approach to attribution of information in the Participants' Views sections:

- organizations have been named;
- individual participants have not been named, except when directly quoted, but are listed in Appendix 6; and
- the views of experts and consultants retained by an organization are attributed to the organization.

Project Terminology

The preferred construction sequence for the Project has changed over the course of the environmental assessment process. Nalcor has used S1, S2 and S3 to describe the various possible development sequences; however, for the sake of clarity in its report, the Panel has opted to use the following terminology:

- "Project" refers to the development of both Muskrat Falls and Gull Island generating facilities and reservoirs and interconnecting transmission lines;
- "Muskrat Falls" includes the Muskrat Falls generating facility, reservoir and associated transmission lines; and
- "Gull Island" refers to the Gull Island generating facility, reservoir and associated transmission lines.

Precaution

The Panel has approached its responsibilities in a precautionary manner, consistent with the Terms of Reference, and the purpose of the *Canadian Environmental Assessment Act*. The Panel has interpreted its responsibility in this regard to mean that in case of uncertainty, it has erred on the side of caution. This approach required the Panel to identify risks associated both with proposed actions and with inaction. In case of doubt and high uncertainty, the Panel has endeavoured to take the less risky path.

Significance

In order to determine the significance of environmental effects, the Panel reviewed the information and views provided by Nalcor and other participants and then applied the criteria outlined in the Canadian Environmental Assessment Agency's guidance document *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (1994):

- Magnitude - the severity of the effects;
- Geographic extent - whether the effects are local, regional or of a larger scale;
- Duration and frequency - whether the effects are long term or temporary, continuous or intermittent;

- Ecological context – whether the location has been previously affected or is ecologically fragile; and
- Dose/exposure – whether the dose or exposure would result in an unacceptable level of risk.

The Panel observes that, within these criteria, no benchmarks or thresholds are provided by the Canadian Environmental Assessment Agency guidelines, the Panel's Terms of Reference, or the EIS Guidelines. Proponents involved in panel reviews have tended to propose their own thresholds in their EIS, with participants indicating their agreement or critique of those thresholds. Ultimately, it is the responsibility of the Panel to select and apply the thresholds it believes to be most appropriate – the higher the threshold, the less likely that significant effects would be determined.

The Panel notes that there has been a tendency for proponents to view the significance determination as a pass-fail test, with the goal being to demonstrate that project design and mitigation measures would result in no significant adverse environmental effects. The assumption seems to be that a single significance finding could potentially be a "show-stopper", preventing a project from proceeding, and that the absence of a significance finding would be an automatic green light. "No likely significant adverse environmental effects" was indeed the conclusion put forward by Nalcor in its EIS.

From the perspective of the affected public, however, the suggestion that a large project, causing irreversible changes to a major part of the regional landscape, would not have any "significant" effects may be hard to comprehend. The Panel heard this view from a number of participants who were not necessarily opposed to the Project proceeding in some fashion. In setting thresholds for significance, the Panel has aimed for middle ground on the continuum of possible approaches to significance. While the finding of even a single significant adverse effect triggers the requirement under the *Canadian Environmental Assessment Act* to determine whether a project can be "justified in the circumstances", the Panel considers this type of process – reviewing the totality of a project's effects, both adverse and beneficial – to be appropriate and valuable, particularly in the case of a large and complex undertaking.

On the one hand, the Panel has not assumed in its approach to significance that a single significant adverse effect would necessarily be a "show stopper"; on the other, the Panel has not declared all adverse effects to be significant even though they should all be factored into the overall Project decision. Rather the Panel has identified as significant those adverse effects of the Project that stand out as serious concerns in light of the criteria set out in the Canadian Environmental Assessment Agency's guidance document. It is the role of government decision-makers to weigh all effects, risks and uncertainties in deciding whether the Project should be permitted to proceed in light of these concerns. In Chapter 17, the Panel offers some assistance to government decision-makers in this complex and important task.

Mitigation, Monitoring and Adaptive Management

The Panel considers that mitigation consists of specific measures to respond to predicted effects and these measures can effectively reduce an otherwise significant effect. Monitoring consists of identifying the effectiveness of mitigation measures, while adaptive management provides a mechanism to respond when mitigation is not effective. It is the view of the Panel that adaptive management, unlike mitigation, cannot reduce an otherwise significant effect.

Recommendations

The Panel is an advisory rather than a decision-making body. The final decisions regarding Project approval will be made by the federal and provincial governments. Thus the recommendations made by the Panel in this report do not presume that the Project necessarily would or would not proceed, as reflected in the wording "The Panel recommends that, if the Project is approved ...". Unless otherwise noted, the Panel's recommendations apply to both or either of the Muskrat Falls and Gull Island components of the Project. The reader is directed to Chapter 17 for the Panel's views, based on the findings of the review process, on how to approach the identification of an overall conclusion.

Effects of the Environment on the Project

The Panel addresses the effects of the environment on the Project in individual chapters.

Cumulative Effects

Cumulative effects with past, present, and future activities, including interactions with climate change, are addressed in the relevant chapters throughout the report. Cumulative effects methodology is discussed in Chapter 16.

Biodiversity

The Panel has considered genetic, species and habitat/ecosystem biodiversity in Chapter 6 (Aquatic Environment) and Chapter 7 (Terrestrial Environment and Wildlife).

Capacity of Renewable Resources

The Panel's Terms of Reference require the Panel to address the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and of the future. The impact on resources is addressed in Chapter 6 and Chapter 7, and the impact on the needs of the present and of the future, in Chapters 8 and 9. The Panel notes that additional information on current uses of land and resources by some of the Aboriginal groups may be brought forward during the consultations that follow the submission of this report.

4 PROJECT NEED AND ALTERNATIVES

This chapter addresses the Project need, purpose and rationale, alternatives to the Project, and alternative means of carrying out the Project.

The main issues include: the scope of the Project and its need and purpose; justification of the Project in energy and economic terms; the viability of the Project to the extent that it is able to generate the predicted long-term financial benefits to the provincial economy; alternative energy sources and Nalcor's conclusion that none could meet the stated need; separate consideration of Muskrat Falls and Gull Island; and Nalcor's position that Muskrat Falls is the least cost option for meeting domestic demand. With respect to alternative means of carrying out the Project, the Panel focuses its analysis on construction sequence and pace, and reservoir preparation.

There is a cross link between the information on energy and economic justification in Section 4.1 and the financial information on alternatives in Section 4.2, particularly with respect to Muskrat Falls.

4.1 NEED, PURPOSE AND RATIONALE

4.1.1 Nalcor's Views

Nalcor stated at the hearing that, since 1980, the price of fossil fuels has increased significantly and residents of Newfoundland and Labrador have increasingly relied on thermal sources of energy to meet their domestic demands. Further, individuals and governments around the world have begun to realize the significance of global warming, the contributions of greenhouse gas emissions to global warming, and the need for energy sources that are less greenhouse gas intensive. As such, Nalcor has defined the need for the Project as being to:

- address the future demand for electricity in Newfoundland and Labrador;
- develop the Province's hydroelectric resources for the benefit of Newfoundland and Labrador and its residents, in accordance with Provincial energy policy;
- secure a renewable future for the Province; and
- generate long-term revenues for the people of Newfoundland and Labrador.

Nalcor stated that the purpose of the Project was to develop the hydroelectric potential of the lower Churchill River and in so doing, provide hydroelectric power to residents, communities and industries in the province and elsewhere. In achieving this purpose, the Project would generate revenue for the Province, reduce fossil fuel use and contribute to the security of energy supply for the Province and for Canada. The Project would meet the requirements of the Province's 2007 Energy Plan and would contribute to the objective of reducing greenhouse gas emissions in the province and beyond. The stated rationale for the Project was to meet the needs identified in the province and elsewhere for cleaner, renewable energy, and to address the principles of sustainable development while carrying out Nalcor's mandate to develop and deliver electrical power and energy for both domestic consumption and export.

In line with the Province's Energy Plan, the first priority for power from the Project would be to meet the current and future energy needs of the Province; the second, to support possible new industrial growth; and, once these two are met, the remaining electricity would be exported to generate revenue. Of the 3,074 MW of renewable power produced by the Project, up to 800 MW would be required eventually to meet provincial needs, including the potential replacement of Holyrood and industrial load growth on the Island. The remaining power would be available to

attract new large-scale industrial developments or for export to customers and markets in northeastern North America.

The Province's Energy plan directed Nalcor to consider two options for addressing the environmental problems at the Holyrood Generating Station, either replace the electricity generated at Holyrood with electricity from the Lower Churchill Project or install scrubbers and electrostatic precipitators to control emissions. Nalcor stated that the Project would produce minimal greenhouse gas emissions, both during construction and operations. The power produced would be clean power that would generate less greenhouse gas emissions per unit of electricity than any coal, natural gas, or oil-fired power plant. In addition, since the two reservoirs would be relatively deep and narrow compared to other large hydroelectric facilities in Canada and elsewhere, they would release lower quantities of greenhouse gas than other facilities with a similar output. Nalcor further stated that the World Commission on Dams had determined that reservoirs in boreal climates generate fewer greenhouse gases than elsewhere. Nalcor concluded that the Project is one of the most important opportunities for Canada and the Atlantic Provinces to curb their current greenhouse gas and other emissions and to meet their greenhouse gas emissions reduction targets. Additional information on greenhouse gas emissions from the Project is presented in Chapter 5.

Nalcor's closing comments stated that the Energy Plan and its key goals were subjected to extensive public consultation. The key goals were responsible development of renewable sources of energy; ensuring a secure, reliable and competitively-priced supply of energy for current and future needs of the Province; maximizing long-term export value from all surplus electricity supplies; and, re-investing oil and gas revenues for the future well-being of the Province's residents. The Project was considered the centerpiece of the Energy Plan and the most attractive undeveloped hydroelectric project in North America. Nalcor, a Crown Corporation, was obligated to take the steps necessary to fulfill the Province's policy direction.

Nalcor further stated in closing comments that the "need for" and "purpose of" a project should be established from the perspective of the project proponent and should provide the context for consideration of "alternatives to" the scoped project. Similarly, "alternatives to" a project should be considered in relation to the project need and purpose and from the Proponent's perspective. Also, the Panel's consideration of need, purpose and alternatives should not be an audit of the economics of the Project or of energy policy.

Justification in Energy Terms

With respect to provincial needs, Nalcor forecasted a capacity deficit on the island by 2015 and an energy deficit after 2018. Nalcor's position is that up to 800MW are required to meet provincial demand to 2067 and that alternatives to meet that demand are more costly and would generate higher greenhouse gas emissions compared to the Project. At this stage, there are no known additional energy intensive industry requirements.

Nalcor stated that aging infrastructure is a key concern for utilities across North America and replacement of this infrastructure is driving investment by many utility companies. The primary market opportunities for the Project arise from this concern, from the need to replace greenhouse gas emitting generation sources, the need to meet new growth and demand for energy and capacity, and to meet the demand for more dispatchable power.

Nalcor indicated that in 2008, the Canadian Electricity Association reported that nationally, 74,000 MW of additional capacity were needed to meet demand growth and plant retirements. In Newfoundland and Labrador, the 500 MW generating station in Holyrood would be replaced by 2020 since it would have reached the end of its useful life. In Nova Scotia 1,430 MW of

installed capacity and in New Brunswick 332 MW of installed capacity would reach the end of their service life by 2030. In Ontario 8,200 MW of installed capacity in coal-fired facilities and the Pickering nuclear facility are to be eliminated by 2020. In total, 14,000 MW of installed capacity in Newfoundland and Labrador, Nova Scotia, New Brunswick and Ontario are expected to be replaced by 2030. A major portion of Nalcor's long-term energy sales portfolio would target these market opportunities.

In the United States, over 45,000 MW of installed capacity would have to be replaced by 2035 and in New York State, almost half of the generating infrastructure is over 30 years old. However, given uncertainty in New England and New York as to when various plants would be retired, Nalcor viewed the US markets as short-term export sales opportunities.

In summary, Nalcor estimated that by 2020 the overall identified market potential would be almost eight times the size of the annual Project output (i.e. 134.8 terawatt hours compared to the Project's 16.7 terawatt hours).

Nalcor indicated that it was continuing to assess multiple transmission options to distribute electricity generated by the Project. To meet domestic demand for electricity, an 800 MW transmission line from Labrador to the Island would be built. This transmission line is currently undergoing an environmental assessment. Electricity from Muskrat Falls would be transmitted to the Island portion of the province, the Maritime Provinces and the northeastern United States through high voltage direct current transmission lines and underwater cable crossings at Belle Isle and the Cabot Strait. Firm markets have been identified for Muskrat Falls production as follows: approximately 40 percent would be used on the Island to replace the Holyrood thermal generating facility, 20 percent would be exported to Nova Scotia through an agreement with Emera Inc., and 40 percent would be available for export to the Maritime Provinces and northeastern United States. The Agreement with Emera would result in Emera funding and constructing a 500 MW subsea link between the Island of Newfoundland and Cape Breton Island in return for approximately 170 MW, or one terawatt hour, of production from Muskrat Falls for a period of 35 years at no additional cost. Nova Scotia would use the power for the retirement of coal-fired production and to help meet renewable energy targets. Emera would invest over \$1.2 billion, or 20 per cent of the capital cost of the entire Project, and would be responsible for 20 per cent of the operating costs of the Project for the 35-year life of the contract. In return, Nalcor would have access to the subsea link and other transmission capacity in Nova Scotia for the sale of 340 MW of power to the Maritime Provinces or the northeastern United States. At the end of the 35-year period, Nalcor would own the maritime link.

Nalcor envisaged that other export markets for the Project would be accessed via the Hydro-Québec TransÉnergie system or via the submarine transmission system through Newfoundland and on to the Maritime Provinces. Over the longer term, both of these transmission options would be used to supply export markets in North America. However, in the short term, lack of access to the Hydro-Québec TransÉnergie system could affect the construction sequencing of the Project in that neither component of the Project would begin until there was a level of market access that supported it.

Nalcor indicated that, despite recent set backs with Hydro-Québec and the Quebec utilities regulator (Régie de l'Énergie), it had continued to pursue accessing the Hydro-Québec TransÉnergie system. Nalcor stated that Hydro-Québec, as a participant in the North American electricity industry, had an obligation to provide Nalcor access to its transmission system.

Nalcor stated in its final submission to the Panel that without the Project the Province would lose an opportunity to create long-term revenue to fund social programs. The Province would have to

meet its projected increased energy needs through more expensive and greenhouse gas intensive alternatives, and Labrador would not be able to attract as much future industrial development, which would prevent diversification of the region's economy.

Justification in Economic Terms

Nalcor stated that the Project would be economically and environmentally sustainable and would provide a large-scale renewable source of energy for the next 100 years and would provide positive economic benefits for the Province for at least a decade during construction. The Project would enable other renewable energy generation opportunities in the future.

Nalcor's position is that the Project has attractive per unit economics that are unmatched by other Canadian hydroelectric developments. It has a competitive advantage over other renewable projects, including the Romaine hydroelectric project, and as demand increases, the economics of the Project are expected to be more attractive compared to other more expensive projects. In a 1992 National Energy Board Study, the Project's two generating facilities ranked among the top hydroelectric sites in North America. The levelized unit energy cost for Gull Island and Muskrat Falls were estimated at 3.92 cents and 4.47 cents per kilowatt hour (KWh) (2000 dollars) respectively. However, the ultimate delivered price to any market (over and above generation costs) would depend upon a number of factors including cost of any upgrades to existing transmission systems, cost of any new systems required, effects of carbon regulation, negotiations with power purchasers, and negotiations with lenders.

Nalcor estimated that the escalating cost (nominal cost) of electricity to the Island upon completion of the Muskrat Falls facility would be approximately 14.3 cents per KWh when transmission costs and other factors had been included.

Nalcor expects natural gas fired combustion turbines would remain the main competitor of hydroelectricity and prices for natural gas are expected to increase. Nalcor was not aware of any new technologies that would affect the Project's competitiveness.

Nalcor indicated that it had undertaken extensive financial analysis of the Project using models developed by Nalcor with advice from PricewaterhouseCoopers. A discounted cash flow modelling technique was used. Key inputs to the financial model were hydrology, market prices, sales portfolio, capital expenditures and operating costs, along with economic assumptions developed by Nalcor's Investment Evaluation and Project groups and external experts. Electricity market prices were based on estimates by the PIRA Energy Group until 2025 and then escalated at two percent per year thereafter.

Nalcor, with the assistance of PricewaterhouseCoopers, also developed financing assumptions, including capital structure, debt terms and conditions, and an equity target rate of return. The key financing assumptions were: a length of analysis of 50 years from the full in-service date; a 70/30 debt-equity ratio; a 30 year borrowing term; interest rate of 7.3 percent; an exchange rate of \$0.964; and a target rate of return on equity of 12 percent. The result of this analysis indicated that the Project's rate of return on equity would be 14.7 percent.

A sensitivity analysis using four key variables showed the rate of return on equity was most sensitive to changes in market prices, then capital cost, interest rate and finally capital structure. A drop of 15 percent in market prices would still generate a return on equity in the range of 12 percent.

Nalcor estimated that the total capital cost of the Project would be \$6.4 billion in 2010 dollars. The financial benefits to the Province would be generated by financial returns from the Project

that would generate profits and dividends to the shareholder and through broader economy-wide benefits resulting from the construction and operation of the facilities. The Project is estimated to generate in excess of \$1.1 billion in 2010 dollars annually in net financial benefits to the Newfoundland and Labrador economy once the construction debt has been retired, estimated to occur 30 years after completion of both facilities. Nalcor stated that the government of the day would distribute the financial benefits from the Project.

In response to the Panel's detailed financial questions dated March 21, 2011, Nalcor stated that Muskrat Falls would generate in excess of \$300 million in 2010 dollars annually and Gull Island would generate approximately \$700 million. Figures 4 and 5 below show the initial losses, the gradual build up of cash flow over time, and the years in which the target numbers would be achieved for Muskrat Falls and Gull Island respectively.

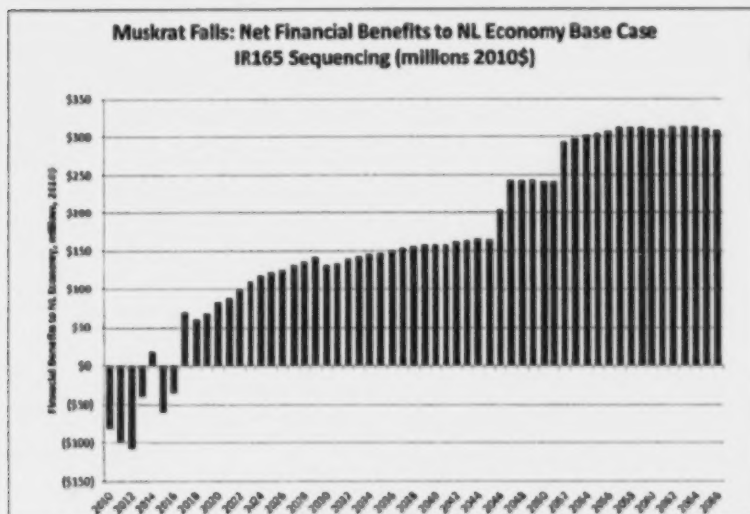


Figure 4. Muskrat Falls net financial benefit to Province (Source: Nalcor)

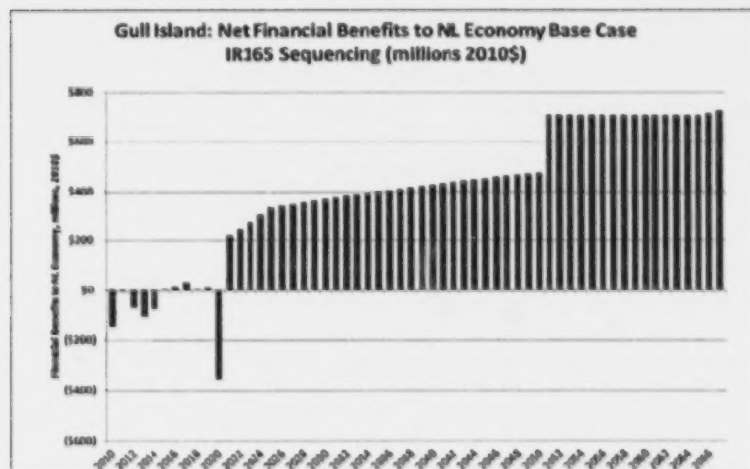


Figure 5. Gull Island net financial benefit to Province (Source: Nalcor)

The above figures reflect the Muskrat Falls facility being operational by 2017 with a projected debt/equity ratio of 59:41 and an interest rate of 7.3 percent. The Gull Island facility would be operational by 2021 with a projected debt to equity ratio of 70:30 and the same interest rate of 7.3 percent.

In response to questions at the special hearing, Nalcor indicated that the 41 percent equity content for Muskrat Falls was a fine-tuning in response to financial markets as part of the preparation of a financial package. Further, the shareholder might forgo dividends on this equity so that the Province might not receive a significant revenue stream from Muskrat Falls. Given the agreed distribution of Muskrat Falls output, the assumption is that 80 percent of the output would be sold at a rate that recovers the full generating cost of 7.7 cents per KWh for all power generated.

4.1.2 Participants' Views

Participants, including Grand RiverKeeper Labrador Inc. and Sierra Club Atlantic in particular, were critical of the fact that Nalcor did not provide much of the detailed financial information on Muskrat Falls and alternatives until the last few days of the hearing. Sierra Club Atlantic stated that Nalcor had failed to demonstrate the stated need for the Project and that future provincial electricity demand could be met through aggressive demand side management, small-scale hydro, wind, power recalled from Hydro-Québec, and other means. Nalcor had not demonstrated the ability to deliver the power to market or the associated costs and had exaggerated both the demand projections and returns from potential markets. Ongoing accelerated demand side management, clean alternatives and smart-grid rollout in many export markets would reduce the demand for Lower Churchill energy considered by Sierra Club Atlantic to be an expensive energy source.

Grand RiverKeeper Labrador Inc. and Sierra Club Atlantic felt that the stated purpose of developing the hydroelectric potential of the lower Churchill River was circular and used throughout the assessment process to justify the Project - that is, the purpose of the Project would be to do the Project. As a result, Nalcor had failed to adequately consider alternatives to the Project.

The Mayor of Happy Valley-Goose Bay stated that the Town Council fully supported the Project and that it had the potential to be the most important factor in the future growth of the community and possibly all of Labrador. He also noted that the Atlantic Mayors' Congress recently passed a resolution giving its unanimous support to the Muskrat Falls development. As the nearest community to the Project, the Town was seeking guaranteed benefits including electrical power at competitive rates and a Labrador Heritage Fund. The fund could be in the form of an enhanced Northern Strategic Plan or a new comprehensive Labrador agreement fund. The Town would continue to work with Nalcor and other stakeholders in the local area to ensure that they receive maximum benefits from the Project with minimal negative impacts. The Labrador North Chamber of Commerce and the Central Labrador Economic Development Board expressed similar sentiments.

The St. John's Board of Trade indicated that it supported the Project and wanted it to move forward in a timely fashion.

Other participants stated that they did not want the Churchill River destroyed or the way of life of Labradorians disrupted just to provide energy for the Island portion of the province or to generate profits through the sale of power to third parties. A few participants further indicated that if the Island portion of the province needed additional energy, or Nalcor wanted to shut

down the Holyrood facility, Nalcor should look at damming rivers on the Island rather than damming rivers in Labrador.

Sierra Club Atlantic stated that Nalcor had over estimated the benefits of the Project and had ignored new energy capacity that will occur between 2015 and 2030 in the export markets identified. It further stated that Nalcor had failed to demonstrate the need for new capacity to displace higher carbon intensity generation.

Helios Corporation indicated that in the first 10 to 20 years of Muskrat Falls operation, the returns from export sales would not cover all capital and operating costs given the highly competitive nature of those markets and the modest prices that would likely be paid for the electricity. It further stated that, once the debt had been paid off, the Public Utilities Board would not allow Nalcor or Newfoundland Power to continue to charge the same rate for electricity because electricity rates are based on the cost of delivery, and, once the debt is paid, the generation costs would be reduced.

Sierra Club Atlantic indicated that Nalcor was ignoring the impact of the "paradigm shift that smart grids with smart metering are having in target markets". Smart grids use sensors, meters, digital control and analytic tools to automate, monitor and control the two-way flow of energy across operations from power plant to plug. Smart grids also incorporate new sustainable energy such as wind and solar generation and interact locally with distributed power sources or plug-in electric vehicles.

Other participants indicated that the estimated cost per kilowatt-hour for Muskrat Falls power to customers on the island portion of the province would be significantly higher than the current rates and they were doubtful that the rates could be economical in competitive marketplaces.

4.1.3 Panel Conclusions and Recommendations

In reaching its conclusions on Need and Purpose of the Project, the Panel considered the following factors to be particularly relevant:

- Nalcor's stated Need and Purpose for the Project;
- whether Nalcor has adequately demonstrated the need;
- the fact that many participants questioned whether developing the hydro electric resources of the Churchill River is a need;
- implications of separate sanctioning decisions for Muskrat Falls and Gull Island;
- the fact that a number of community and business leaders have expressed support for the Project;
- Nalcor's detailed presentations on potential markets and on economic considerations both for the Project as a whole and for Muskrat Falls and Gull Island separately;
- whether Nalcor has underestimated the effects of new technologies and new energy initiatives in targeted markets and overestimated the Project's economic advantages in those markets, as some participants have stated;
- questions related to alternative ways of meeting domestic demand;
- uncertainties regarding transmission access for export markets; and
- uncertainties regarding the ability of the Project to deliver the long-term financial benefits to the Province as projected by Nalcor.

Nalcor's position is that it has put forward the Need and Purpose of the Project from the Proponent's perspective, and that it is the Panel's mandate to consider this need, purpose and

rationale so it can better understand the objectives the Proponent is trying to achieve with the development of the Project and determine whether the Proponent has considered alternatives to the proposed Project that achieve those objectives.

The Panel has considered and does understand Nalcor's statement of Need and Purpose and the objectives it is trying to achieve, and has observed that these are consistent with the Province's Energy Plan and Energy Policy. The Panel does not question the Province's Energy Plan and Energy Policy.

The Panel has also considered the concerns and comments put forward by participants and notes that Nalcor, by including the development of the hydroelectric resources of the river as a need, did not allow for the proper consideration of potential alternatives for addressing the other elements of its stated need.

The Panel concludes that, for its assessment, it considers the Project need to consist of three elements: address the future demand for electricity in Newfoundland and Labrador; secure a sustainable future for the Province; and, generate long-term revenues for the people of Newfoundland and Labrador.

The Panel recognizes that the scope of the Project for environmental assessment purposes includes both the Gull Island and Muskrat Falls generating facilities and interconnecting transmission lines, and notes that the two generating facilities are subject to separate sanction decisions by Nalcor and its shareholder, the Government of Newfoundland and Labrador.

Because Gull Island and Muskrat Falls are subject to separate sanction decisions, the Panel has assessed them separately with respect to alternatives, justification in energy and economic terms, and where possible, with respect to other considerations.

In looking at the justification of the Project in energy and economic terms, the Panel has considered Nalcor's information on potential markets and the Project's competitive advantage in those markets. The Panel has also considered the concerns and contrary evidence put forward by participants.

In summary, Nalcor's position is that up to 800 MW of energy from the Project will be required to meet provincial demand to 2067 and that there are market opportunities for energy export that exceed the output of the Project by a factor of eight during the Project's planning horizon. Nalcor states that it has identified these opportunities in Ontario, the Maritime Provinces and New England, based, among other things, on the need in those markets to replace aging infrastructure and to displace higher greenhouse gas emitting sources. Nalcor provided three scenarios for greenhouse gas displacement (high, medium, and low) and stated that, even under its low scenario, the Project would displace significant greenhouse gas emissions. This subject is discussed further in Chapter 5. Finally, Nalcor believes the Project has cost advantages over other projects and can economically deliver power to the markets identified.

The Project's ability to meet the stated need of providing significant long-term annual net financial benefits to the Province is dependent on its economic strength.

Nalcor has stated that it believes the economics of the Project are robust. It has presented cash flow analysis and financial statements showing a projected return on equity for the Project as a whole in the order of 14 percent, and projected annual net financial benefits to the Province in the order of \$1.1 billion by 2050. Nalcor has also discussed the economic and energy justification of Muskrat Falls and Gull Island separately, and at the Panel's request, has

produced separate cash flow analyses for each. As well, Nalcor has provided a sensitivity analysis showing how the Project economics change with changes in certain key variables.

Many participants believe there are more cost effective alternatives to meet domestic demand. With respect to export markets, a number of participants stated that Nalcor has not demonstrated its ability to deliver energy to the targeted markets or at what costs. They also believe that Nalcor has underestimated the effects of competing new initiatives, such as aggressive conservation and demand management programs and the use of smart grids in the targeted markets and that Nalcor has overstated the Project's economic advantages in those markets.

The Panel notes that Gull Island is no longer Nalcor's preferred starting Project even though as a generating facility it has a much lower per unit generation cost than Muskrat Falls, and therefore would be a better option for meeting domestic demand provided the surplus energy could be sold. The Panel can only assume that the lack of transmission access through Quebec for Gull Island energy is a significant factor in that decision.

For Muskrat Falls, questions have been raised regarding returns from the portion of energy to be exported through Nova Scotia to New England and other Maritime Provinces. One participant indicated that his analysis suggests that, in the early years at least (10-20 years), the returns from those export markets would not recover costs.

The Panel notes that the main driver for the Muskrat Falls projected cash flow provided to the Panel comes from Nalcor's projected Island domestic rates that continue to escalate by two percent per annum even after Project debt payout. There are also questions about the regulatory treatment of Muskrat Falls by the provincial Government and the Public Utilities Board. It is not clear how much of the overall Muskrat Falls cost would be permitted to be passed on to the Newfoundland rate payer and what the implications are for the ability of Muskrat Falls to generate a long-term revenue stream for the Province. Further, Nalcor indicated at the hearing, that in its analysis, Muskrat Falls includes a high equity content (41 percent) and that the shareholder might forgo dividends so that not much of a revenue stream is expected from Muskrat Falls for distribution.

While the Panel concurs with Nalcor that the Panel's role is not to conduct an "audit" of Project economics, it cannot help but note the significant issues created by the transmission access uncertainties discussed above and the impact these have on the Panel's confidence level that the Project would in fact deliver the long-term financial benefits projected. This is discussed further in Chapter 12, Economy, Employment and Business.

The Panel has been told that Nalcor, its shareholders, and project financiers understand economic considerations sufficiently that unless markets and project viability are properly demonstrated, the Project cannot be sanctioned. The Panel notes that even if the Project as a whole, or Muskrat Falls or Gull Island individually, were to meet sanction requirements, it still might not necessarily provide long-term financial benefits to the Province for distribution, as projected by Nalcor. The Panel also notes that governments are expected to make their decisions on the environmental assessment of the Project before knowing whether either of Muskrat Falls, Gull Island, or both, would be sanctioned.

Whether the Project is considered as a whole or as separate generating facilities, the Panel finds that there are two significant outstanding questions. The first is whether the Project is the best alternative for meeting domestic demand. This is addressed in Section 4.2, Alternatives to the Project. The second has to do with the availability of transmission access to deliver a significant portion of the Project's energy to export markets, whether markets would be

available, which markets, when, and at what price could the power be sold. Nalcor's proposal for Muskrat Falls includes export capability of part of the output via the planned Maritime Link. However, no certain transmission capability has been identified for the much larger energy output of Gull Island.

The Panel concludes that, in light of the uncertainties associated with transmission for export markets from Gull Island, Nalcor has not demonstrated the justification of the Project as a whole in energy and economic terms.

The Panel further concludes that there are outstanding questions for each of Muskrat Falls and Gull Island regarding their ability to deliver the projected long-term financial benefits to the Province, even if other sanctioning requirements were met.

RECOMMENDATION 4.1 Government confirmation of projected long-term returns

The Panel recommends that, if the Project is approved, before making the sanction decision for each of Muskrat Falls and Gull Island, the Government of Newfoundland and Labrador undertake a separate and formal review of the projected cash flow of the Project component being considered for sanctioning (either Muskrat Falls or Gull Island) to confirm whether that component would in fact provide significant long-term financial returns to Government for the benefit of the people of the Province. Such financial returns must be over and above revenues required to cover operating costs, expenditures for monitoring, mitigation and adaptive management, and financial obligations to Innu Nation. The Panel further recommends that the Government of Newfoundland and Labrador base these reviews on information on energy sales, costs and market returns that have been updated at the time of sanction decision, and make the results of the reviews public at that time. The financial reviews should also take into account the results of the independent alternatives assessment recommended in Recommendation 4.2.

4.2 ALTERNATIVES TO THE PROJECT

4.2.1 Nalcor's Views

Nalcor stated that, after evaluation of all alternatives, it concluded there were no technically and economically feasible alternatives to the Project that could deliver over 3,000 MW of capacity and 16.7 terawatt hours of electricity annually with an attractive rate of return to the Province, and that fulfilled the Energy Plan commitment to replace production from the Holyrood thermal generation station. Further, the Project represented the least cost alternative for meeting the energy demands of the province and was the only option available to Nalcor pursuant to subsection 3(b)(iii) of the *Electrical Power Control Act, 1994*.

Nalcor indicated that its evaluation had considered a number of alternatives to the Project including:

- management of electricity demand through utility-based energy efficiency and conservation initiatives;
- alternative generation sources (e.g., hydrocarbons, wind, nuclear, run-of-river hydroelectric developments);
- the addition of more capacity at existing generation facilities; and
- no Project.

Regarding domestic demand projections, Nalcor indicated in the EIS that by 2027, an additional 582 MW of generating capacity would be required, a 29 percent increase over the 2007 requirements of 1,984 MW. This projection was reduced in 2008 to an additional peak capacity requirement of 531 MW by 2027 with new industrial development and 359 MW without industrial development. In 2009, after factoring in closure of the Abitibi Bowater mill at Grand Falls, the projection was further reduced to an additional peak load requirement of 244 MW by 2027 without industrial development.

At the hearing, Nalcor predicted that the annual growth rate in electrical consumption for the Island portion of the province between 2010 and 2041 would be approximately one percent, but over its entire study period from 2010 to 2067, predicted growth would be 0.8 percent. On this basis, Island electricity demand would grow from the current level of approximately 1,500 MW to 2,300 MW and consumption would increase from 7 to 8 terawatt hours to 12 terawatt hours between 2010 and 2067. Nalcor also predicted that by 2015, the existing energy capacity on the Island would not be sufficient to meet established reliability standards.

Energy Conservation and Demand Management

The EIS stated that conservation and demand management could achieve a maximum 12 percent reduction in energy consumption during the period from 2007 to 2027.

Newfoundland and Labrador Hydro had commissioned Marbek Resource Consultants to assess conservation and demand management potential for the province. Marbek's study looked at residential, commercial and industrial sectors and estimated total energy savings that could be achieved if all consumers installed cost-effective technologies. Estimates of upper and lower levels of potential energy savings were given for four five-year periods ending in 2011, 2016, 2021, and 2026.

Based on this assessment, Newfoundland and Labrador Hydro and Newfoundland Power jointly filed a five-year Energy Conservation Plan with the Public Utilities Board in 2008. Although the target for this plan was much less than Marbek's conservative or lower estimate for the period, Nalcor acknowledged that it did not expect to achieve the target.

Nalcor indicated that the provincial budget for 2011 conservation and demand management was \$3.1 million, which was approximately 0.75 percent of utility revenues. The Marbek study suggested that 1.5 percent of electricity revenue was an appropriate level for a jurisdiction in the early stages of conservation and demand management programming and expenditures had been growing towards this level. The Marbek report further described ramping up to a budget of 3 percent of revenues as an appropriate level of expenditure with program delivery experience. This would be well beyond the current five year Energy Conservation Plan but would be an achievable budget level for longer term planning. In examining the budgets for other utilities, Nalcor indicated that a target of 1.5 percent of expenditure would be consistent with utilities that have been active in conservation and demand management for a significant time.

Nalcor's final position was that conservation and demand management alone could not result in savings that would negate the need for the Project because the potential for conservation and demand management to reduce energy demand in Newfoundland and Labrador was marginal and insufficient to offset production from the Holyrood Plant. Nalcor stated reason was that Newfoundland and Labrador consumers have not had much experience with conservation and demand management and therefore participation rates in these programs have been low. In the longer term, conservation and demand management was viewed as an important tool to help offset future energy demand growth or to produce energy savings that could be sold to export markets, particularly if the province were connected to the North American grid.

Alternative Generation Sources

Nalcor indicated that, together with the Province it studied the potential for wind and the role it could play in the energy supply mix. Since wind was an intermittent resource, it could not reliably provide power when needed, and therefore must be backed up by firm sources of power such as imports through an interconnected system or hydroelectric facilities with sufficient storage capability. However, in Newfoundland and Labrador there were not sufficient sources of firm power to allow any further large-scale investments in wind over and above the estimated maximum of 80 MW that could be accommodated in the Island system with minimal adverse economic effect. Of this estimated maximum number, some 54 MW are already in place.

Nalcor stated that it plans to expand wind generation in the province as a complement to more reliable and dispatchable sources of power. It sees future wind developments, similar to the wind farms in St. Lawrence and Fermuse as good business opportunities given the wind resource in the province. However, such developments would not be pursued unless and until the province had access to a larger load base that can balance the variability of wind generation.

Nalcor indicated that alternative hydroelectric developments on the Island would not allow the Province to meet its projected future demands and would thus require continued dependence on the Holyrood plant. In addition, these small-scale hydroelectric developments would not involve storage to enable it to respond to fluctuations in energy demand. Therefore, like wind, the successful integration of undeveloped Island hydroelectric developments into the provincial energy grid would be conditional upon interconnection to a larger grid and/or additional storage capability, neither of which currently exists on the Island.

According to Nalcor, power from the Churchill Falls project would not be an alternative to the Lower Churchill Project, since the current Churchill Falls power sale contract with Hydro-Québec does not expire until 2041 and there is no opportunity to renegotiate. Recall power that would be available under that contract is currently sold to third parties. Also, the recall power is "loaded" meaning that once the power is recalled it would have to be used and could not be returned, so if recall power were used to back-up non-dispatchable renewable energy such as wind power, it would be lost when the wind system is providing electricity. Any additional investment in wind power would not provide any net benefit to the Province.

Nalcor stated that the economic and technical feasibility of tidal power were both unproven and the environmental effects of large scale tidal projects unknown. Further, Nalcor indicated that this energy source did not have the potential to generate the quantities of power generated by the Project.

Nalcor estimated that the cost of small scale alternative generation would be more than double the cost of the Muskrat Falls component of the Project. In addition, large scale integration of these sources is not technically feasible because of the limited storage and intertie available from Newfoundland to other markets. These factors, combined with the substantial cost of transmission upgrades that would become necessary and the operating complexity of knitting such a web of options together, preclude small-scale generation from being a viable alternative to the Project, or even to meeting the domestic energy demands of the province.

Responding to the suggestion made during the hearing that natural gas from offshore developments might be a viable energy source for future electricity production, Nalcor stated this alternative was hypothetical. Current offshore operators have not identified a viable business case for transporting and marketing their natural gas reserves. Thus, this industry

would not exist on the Island for the foreseeable future and does not have the potential to meet the need for or the purpose of the Project.

Nalcor did not consider nuclear energy because of a legislative ban on such power generation in the province.

Nalcor indicated that run-of-river hydroelectric development on the lower Churchill River, was not technically or economically feasible. It stated that run-of-river development, without a large reservoir, would not be able to control frazil ice and the lack of flow regulation would mean that the timing of power generation could not be tailored to meet the demand patterns of consumers and ensure reliable service.

Additional Capacity at Existing Generation Facilities

Nalcor indicated that it had looked at improving the efficiency of existing generating facilities on-Island and concluded that there were very limited opportunities to increase energy output of these facilities. Improvements at Cat Arm, Hines Lake and unit 7 at Bay d'Espoir could increase these facilities' output by 1 to 2 percent (up to 30 MW). However, since none of the facilities had any significant spillage, they had no additional capacity. As well, since no environmentally acceptable means of diverting additional water into existing facilities had been identified Nalcor did not view adding additional capacity to existing generation sources as technically or economically viable.

No Project

Nalcor stated that Newfoundland and Labrador Hydro had recently assessed alternative combined generation scenarios, that would include refurbishing and expanding the Holyrood plant, in combination with hydroelectric, wind and other forms of generation required to meet future demand if the Project did not proceed. Nalcor indicated that the resulting thermal scenario would cost \$2.2 billion more than the Project plus the Transmission Link, and would result in a less reliable and more greenhouse gas intensive electricity system.

If the Project does not proceed, there are plans to address the environmental concerns associated with Holyrood. Nalcor estimated that the total cost of installing the necessary pollution control equipment would be \$600 to \$800 million and the resulting energy losses would be three to five percent.

Nalcor stated that not proceeding with the Project would result in the energy needs of the province either not being met or being met through more costly and greenhouse gas intensive alternatives. This would result in the loss of an important economic opportunity for the province. Nalcor indicated that if the Holyrood thermal generating facility were to be taken out of service, in the isolated Island scenario, power produced at Holyrood would have to be replaced by oil-fired combined cycle combustion turbines supplemented by small-scale hydro projects.

Nalcor would have to invest over \$3.2 billion (nominal) by 2030 to upgrade/replace the Holyrood thermal plant and to build new generating capacity, which would include a combination of new thermal generating facilities, wind and hydro projects on the Island. The cumulative present worth of these expenditures is estimated at \$8.1 billion in 2010 dollars.

Isolated island versus Muskrat Falls

Nalcor pointed out that the \$2.2 billion additional cost of its No Project thermal option did not include the cost of fuel for Holyrood and the other additional thermal generators and assumed

no cost for greenhouse gas emissions and no restrictions on extending the life of the Holyrood plant to the 2035 timeframe, both of which would enhance the economic competitiveness of the Project.

Nalcor estimated the levelized unit cost of electricity generation for the Muskrat Falls facility would be 7.7 cents per KWh based on the present value of the total generating costs divided by the present value of the output. The escalating cost (nominal cost) of electricity to the Island upon completion of the Muskrat Falls facility in 2017 would be approximately 14.3 cents per KWh when transmission costs and other factors had been included. Projections for cash flow purposes are that all of the output of Muskrat Falls would be sold with the exception of the 20 percent that would go to Nova Scotia. Rates that would be paid by Newfoundland ratepayers were assumed to escalate by 2 percent per year to 2067.

Figure 6 below was provided by Nalcor and depicts its estimate of the growing difference in the cost of energy (shown in \$ per megawatt hour to 2067) for Island consumers for the thermal island option versus Muskrat Falls.

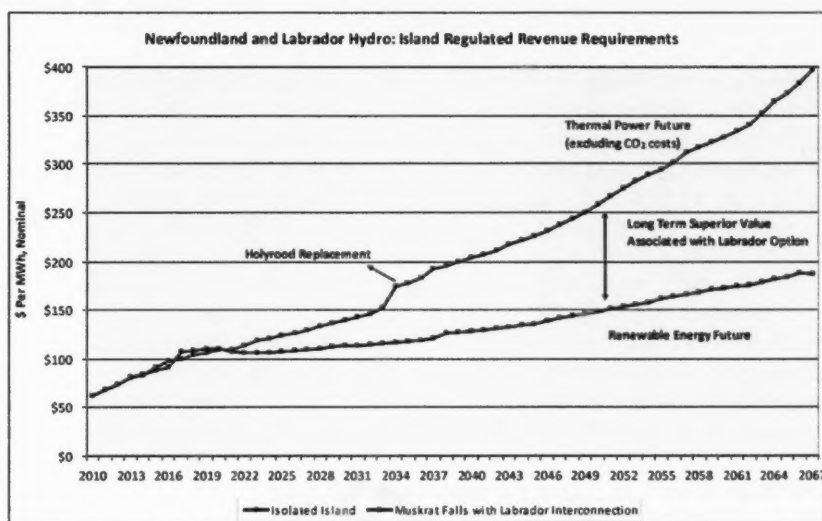


Figure 6. Cost thermal versus Lower Churchill power (Source: Nalcor)

Nalcor also assessed the impact that a 15 percent variation in fuel costs would have on Island revenue requirements. In the case of a 15 percent increase in fuel costs, the net benefit to island ratepayers of Muskrat Falls compared to the thermal alternative would be \$2.9 billion (present value) as compared to the base case \$2.2 billion. In the case of a 15 percent decrease, the net benefit would be \$1.4 billion.

Nalcor stated that the Project would address future energy demand in Newfoundland and Labrador and would ensure that 98 percent of the province's energy supply is renewable and would do so at the lowest cost. Nalcor concluded in its final written submission to the Panel that the Project represents the least expensive and most reliable way for Nalcor to meet future provincial energy demands.

Nalcor also stated a number of times that no other alternatives meet the need for the Project and that Gull Island and Muskrat Falls are the most viable undeveloped hydroelectric

opportunities in North America. The Project would unlock the province's energy warehouse by securing interconnections between Labrador and the Island. This would provide access to other markets and would enable other renewable energy developments, including wind energy. Nalcor indicated that it considered **all of** the renewable energy solutions raised at the hearing as future opportunities and for the most part, they were all included in the Energy Plan.

4.2.2 Participants' Views

Many participants, including Grand RiverKeeper Labrador Inc., Sierra Club Atlantic, and several individuals, expressed concern with the consideration of alternatives and stated that Nalcor had not seriously assessed all alternatives and had dismissed some alternatives too quickly. Many participants spoke about the strong potential for wind power, run-of-river hydro developments, small-scale hydro, tidal power and conservation and demand management.

Grand RiverKeeper Labrador Inc. suggested that there were several other possible alternatives to the Project that were not considered by Nalcor, including converting the existing oil fired facilities at Holyrood to natural gas and integrating the existing Holyrood plant with new wind generation sources. Such integration would reduce the amount of energy that the Holyrood facility would have to produce and therefore reduce the amount of oil burned and the associated greenhouse gas emissions.

Helios Corporation stated that the Marbek study identified a very significant conservation and demand management potential in 2007 and stated that:

- Newfoundland and Labrador Hydro and Newfoundland Power have lagged approximately 50 percent behind the objectives set in the 5-year conservation and demand management plan both in effort and in results. Current conservation and demand management budgets account for just 0.75 percent of utility revenues compared to a recommended level of 1.5 percent in the Marbek study; Newfoundland and Labrador is much behind the rest of Canada.
- Newfoundland and Labrador utilities spent just \$2.22 per capita on conservation and demand management compared to \$29.02 in Quebec and \$40.63 in British Columbia.
- Other utilities are taking conservation and demand management extremely seriously and are looking at zero load growth over the medium term and none of that is happening in Newfoundland and Labrador.
- If a change of corporate culture were to take place to enable a substantial effort in conservation and demand management, it could go a long way to meeting load growth and reducing reliance on Holyrood.
- Island load growth was largely related to the shift to electric baseboard heating, which is inefficient when burning fossil fuels to make electricity. Many regions use explicit policy incentives to discourage electric heating.
- If Marbek redid the study of conservation and demand management potential with a 50 to 100 percent higher avoided cost, based on current projections, it is clear that the potential would be dramatically higher. Avoided cost would be the ceiling determining what kind of measures would be economic.
- How much a utility would be willing to spend and how cleverly it goes about it makes a huge difference on what part of the conservation and demand management potential can be achieved.

Helios Corporation suggested that Nalcor and Newfoundland Power should be looking at integrated resource planning as used in other jurisdictions with considerable success. It cited

the Hawaiian Electric Company Inc. as a utility that has successfully employed this approach since 1992 to ensure that Hawaii's energy needs are met reliably and affordably by selecting the best mix of energy resources. Helios Corporation further stated that utility planning used to be a process of forecasting the loads and finding the least cost generation solutions to meet them. This is generally the approach currently used in Newfoundland and Labrador. Under an integrated resource planning process, planners look simultaneously at supply and demand side alternatives for meeting needs for energy services. The approach to building conservation and demand management programs based on avoided costs is a consequence of this paradigm shift.

The Department of Natural Resources indicated that the Government of Newfoundland and Labrador had recently created an agency responsible for preparing a climate change plan and an energy efficiency plan that would specifically address government's new policy direction on demand management and energy conservation and efficiency initiatives.

The St. John's Board of Trade stated that the Board was not in favour of time-of-day electricity pricing as some provinces have done to manage demand by making electricity more expensive during peak times. The Board felt that effective macro supply management would help avoid unnecessary over-regulation. It stated that Muskrat Falls could support the supply side of the equation and that the demand side could only bear so much additional burden.

Another participant suggested that Nalcor should seriously consider alternative energy sources and that it should become a leader in alternative energy, rather than following Quebec's example of damming all rivers. The participant also felt that Nalcor should have considered a wind power development similar to the 1,000 MW wind park project previously proposed by Ventus Energy, but in conjunction with Churchill Falls instead of the Project.

The NunatuKavut Community Council also referred to the Ventus Energy project, which would have been a joint venture between Metis Energy Corporation and Ventus Energy Inc. If the project had proceeded, it would have involved the construction, operation and maintenance of approximately 500 commercial-scale wind turbines having a total capacity of approximately 1000 MW. The proposed site of the project was 30 kilometres northeast of Churchill Falls above the Smallwood Reservoir and Lake Michikamau and the estimated capital cost was \$1.5 billion.

Helios Corporation indicated that based on the Canadian Wind Atlas data, Newfoundland and Labrador has phenomenal world class wind resources throughout the province and that includes areas of the province close to load centres on the Avalon Peninsula. It further indicated that the conditions suggest a wind turbine could be erected practically anywhere on the Island and have better output (more energy per capacity) than the wind farms that are currently being installed in Quebec. Based on preliminary calculations, a two-MW wind turbine, 80 metres high, would have an average annual use factor of approximately 59 percent of installed capacity increasing to 67 percent in winter. This is double the use factor of many locations where wind farms exist. It further stated that the characteristics of wind power on the Island are different from small hydro power which has low availability in winter when demand is highest due to low river flows. While the intermittency of wind is an important consideration for integration of wind energy into the power grid, geographical diversity is the main solution. The more dispersed wind turbines are the more they tend to compensate for each other's intermittency, resulting in a total generation profile that is increasingly flat.

Further, an 800 MW wind farm on the Island would be similar to the Muskrat Falls hydro project. Both would be base loaded with little if any storage or dispatchability, and both would require an export path for economic reasons. Rough economic modelling of a wind development on the

Avalon peninsula to produce 3.9 terawatt hours per year (comparable to Muskrat Falls) indicated a capital cost of under \$2.5 billion, annual operating costs of \$50 million, and a real levelized cost of power of 7.5 cents per KWh.

The Department of Natural Resources confirmed that the North American Wind Atlas showed Newfoundland and Labrador as one of the windiest places in North America and estimated that the province had over 5,000 MW of wind potential. However, to date, there are only two grid-connected wind farms because the isolated nature of the Island system had precluded further projects.

Many participants stated that the wind power industry was growing quickly and was proving to be a viable alternate form of energy generation. They felt that more wind power could be integrated into the current system if Nalcor were to look at wind energy more seriously.

Some participants stated that there was sufficient power in Labrador, however the issue was that the power was not available when and where it is required. Other participants felt that Nalcor had not considered Churchill Falls recall power in its assessment of the need for the Project, nor had it considered that the Churchill Falls power contract with Hydro-Québec was up for renegotiation and that the contract would ultimately expire in 2041. One participant stated that negotiations with Hydro-Québec should be initiated to have recall released and made available for use in Labrador.

Sierra Club Atlantic stated that, given the modest projected need by 2025 for additional power in the province, it could be met easily by aggressive demand side management and conservation and by lifting the moratorium on small scale hydro that the Province had in place pending the outcome of the Lower Churchill project deliberations. It noted that for every \$1 spent on energy conservation, BC Hydro saved \$3 in generating costs.

A number of participants indicated that while the Muskrat Falls component of the Project would likely proceed based on current market and financial conditions, they were very skeptical about Gull Island proceeding in the foreseeable future given that both components would undergo separate sanction decisions. Participants were of the view that the actual project being considered was a single facility at Muskrat Falls, and that rather than considering alternatives that would replace the full 3,074 MW from both facilities, the Panel should only consider alternatives that would replace 824 MW that would be generated at Muskrat Falls. Participants felt that domestic demand could be met through aggressive demand side management and small-scale hydro projects on the Island portion of the Province.

Grand RiverKeeper Labrador Inc. stated that the Project has substantial economic costs and environmental and social impacts and these impacts should be incurred only if either, the Project meets a need that cannot be met at lower economic, environmental and social costs, or if it produces benefits that are so great as to outweigh these impacts. It stated that there is no reliable evidence that the needs to be met by the Project, namely, serving Island electric needs and reducing or eliminating the use of Holyrood, cannot be met at lower economic and environmental costs by alternate solutions. Such a solution might involve wind, efficiency and demand management, and probably a peaking plant or a transmission line, or in the worst case, the occasional use of Holyrood. It felt that the financial benefits identified by Nalcor were strictly the result of using the monopoly situation to extract funds from ratepayers in excess of the actual cost of the project.

4.2.3 Panel Conclusions and Recommendations

In reaching its conclusions on Alternatives to the Project, the Panel considered the following factors to be particularly relevant:

- Nalcor's position that it considered a list of potential alternatives and concluded that none were economically or technically feasible compared to the Project and none could meet the stated need of developing the hydroelectric potential of the Lower Churchill river (and in so doing generate 3,074 MW of energy);
- the Panel's conclusion respecting Project need in Section 4.1;
- separate sanction decisions for Muskrat Falls and Gull Island leading to separate consideration of alternatives to each;
- Nalcor's information regarding the distribution of Muskrat Falls production;
- Nalcor's analysis and conclusion that there is no lower cost alternative to Muskrat Falls to meet the province's domestic demands;
- questions raised by participants with respect to Nalcor's analysis;
- alternatives suggested by participants to meet domestic demand, including a detailed outline of a proposed 800 MW wind farm on the Avalon; consideration of a more aggressive demand management program (with incentives to curtail electric base board heating); a combination of small hydro and other renewables; and, utilizing natural gas from offshore to replace oil-fired Holyrood;
- information on cash flows, conservation and alternate energy sources (Panel's March 21st letter to Nalcor and Nalcor's response); and
- questions related to the cash flow stream for Muskrat Falls and implications for island rate payers and the regulatory system.

As noted in Section 4.1, it is the Panel's position that Nalcor's inclusion of developing the hydroelectric potential of the lower Churchill River as a Project need led to an inadequate consideration of alternatives to meeting its other stated needs.

With regard to alternatives to the Project, the Panel has focused its attention on Muskrat Falls, on Nalcor's contention that it is the best way to meet domestic demand, and on consideration of potential alternatives to meet that demand. In response to Panel requests, Nalcor has presented considerable detail on the cost of Muskrat Falls power delivered to the Island, on its cash flow and on the assumptions used. That information is summarized in Section 4.1.1 and the Panel raised a number of related questions in Section 4.1.3.

Nalcor has also provided a comparison of Muskrat Falls to its No Project option, where the Island's demand would be met by significant expenditures to upgrade or replace Holyrood and to build new generating capacity, including a combination of new thermal, wind and hydro projects on the island. Nalcor's assessment is that the Muskrat Falls option offers ratepayers a \$2.2 billion benefit compared to its thermal alternative. The comparison period was over a 50 year period, 2017 to 2067. The Panel can also report that this topic generated a significant level of interest, concerns, questions, comments and detailed suggestions from participants as outlined in the evidence presented earlier in this Chapter.

At the same time the Panel acknowledges that Nalcor has significant knowledge regarding details of the Island's grid system, its strengths and limitations, constraints related to dispatchable power requirements, etc., that the Panel and participants generally do not have.

Nevertheless, there are many outstanding issues and these remain despite the considerable attention given to this subject through relevant information requests and at the hearing, including the Panel's March 21st letter to Nalcor, Nalcor's response dated April 1st, and the special hearing session on April 13th to address both. In summary, these include: the significance of several different domestic demand projections; widely different views regarding the potential contribution of energy conservation and demand management to reduce overall energy demand; criticism of current efforts in this province compared to other jurisdictions regarding conservation and demand management; potential contributions of alternate on-Island energy sources; the significance, in energy cost comparisons to 2067, of available Churchill Falls power in 2041 and recall power currently available; Nalcor's cost estimates and assumptions with respect to its no Project thermal option; the economics of offshore gas as a potential less costly option than burning oil at Holyrood; cash flow projection assumptions for Muskrat Falls and implications for Provincial ratepayers and regulatory systems.

It is the Panel's view that all of this should be addressed by commissioning an independent analysis of alternatives. Based on what participants said, such an analysis would provide needed credibility and would be beneficial to both Nalcor and the Government of Newfoundland and Labrador. Further, without the independent analysis, matters regarding the Muskrat Falls income stream, implications for ratepayers, and what electricity rates might otherwise be, cannot be determined.

An appropriate question for the analysis to address is "What would be the best way to meet domestic demand under the No Project option, including the possibility of a Labrador-Island interconnection no later than 2041 to access Churchill Falls power at that time, or earlier, based on available recall?" An independent analysis of this question would provide alternatives that could then be compared to Muskrat Falls and Nalcor's primarily thermal option which was based on complete upgrading and replacement of Holyrood.

The 'best way' to meet domestic demand is not just the least cost. Environmental considerations should be taken into account. For example, without the Project, could some of the emissions from Holyrood be partially or completely displaced by on-Island renewable energy sources?

The Panel concludes that Nalcor's analysis that showed Muskrat Falls to be the best and least cost way to meet domestic demand requirements is inadequate and an independent analysis of economic, energy and broad-based environmental considerations of alternatives is required.

RECOMMENDATION 4.2 Independent analysis of alternatives to meeting domestic demand

The Panel recommends that, before governments make their decision on the Project, the Government of Newfoundland and Labrador and Nalcor commission an independent analysis to address the question "What would be the best way to meet domestic demand under the 'No Project' option, including the possibility of a Labrador-Island interconnection no later than 2041 to access Churchill Falls power at that time, or earlier, based on available recall?" The analysis should address the following considerations:

- why Nalcor's least cost alternative to meet domestic demand to 2067 does not include Churchill Falls power which would be available in large quantities from 2041, or any recall power in excess of Labrador's needs prior to that date, especially since both would be available at near zero generation cost (recognizing that there would be transmission costs involved);

- the use of Gull Island power when and if it becomes available since it has a lower per unit generation cost than Muskrat Falls;
- the extent to which Nalcor's analysis looked only at current technology and systems versus factoring in developing technology;
- a review of Nalcor's assumptions regarding the price of oil till 2067, since the analysis provided was particularly sensitive to this variable;
- a review of Nalcor's estimates of domestic demand growth (including the various projections to 2027 in the EIS (2007, 2008, 2009 and the 0.8 percent annual growth to 2067 provided at the hearing);
- Nalcor's assumptions and analysis with respect to demand management programs (compare Nalcor's conservative targets to targets and objectives of similar programs in other jurisdictions and consider the specific recommendations, including the use of incentives to curtail electric base board heating, from Helios Corporation, among others);
- the suggestion made by the Helios Corporation that an 800 MW wind farm on the Avalon Peninsula would be equivalent to Muskrat Falls in terms of supplying domestic needs, could be constructed with a capital cost of \$2.5 billion, and would have an annual operating cost of \$50 million and a levelized cost of power of 7.5 cents per kilowatt-hour;
- whether natural gas could be a lower cost option for Holyrood than oil; and
- potential for renewable energy sources on the Island (wind, small scale hydro, tidal) to supply a portion of Island demand.

There were also questions about planning mechanisms used by utility companies. Instead of the traditional approach of forecasting loads and finding the least cost generation solutions to meet them, some jurisdictions have moved to an integrated resource planning approach. Evidence was presented at the hearing that this approach has been used successfully in Hawaii and the Panel understands it is also being used in Nova Scotia and in some other jurisdictions in Canada.

RECOMMENDATION 4.3 Integrated Resource Planning

The Panel recommends that the Government of Newfoundland and Labrador and Nalcor consider using Integrated Resource Planning, a concept successfully used in other jurisdictions. Such an approach would involve interested stakeholders and look simultaneously at demand and supply solutions and alternative uses of resources over the medium and long term.

4.3 ALTERNATIVE MEANS

4.3.1 Nalcor's Views

Facilities Siting - Muskrat Falls

The EIS indicated that the proposed Muskrat Falls site was the only technically and economically feasible location for the facility, since it allows full utilization of the available head below Gull Island and the natural topography offered considerable construction advantages. The rock knoll at Muskrat Falls is of particular spiritual significance to Innu because the mythological creature *Uenitshikumishiteu* is said to live there. Nalcor indicated that no technically and economically feasible siting of the Muskrat Falls dam could completely avoid

disturbance at the rock knoll but the preferred alternative resulted in the least amount of disturbance. The preferred alternative would have the powerhouse and spillway located on the south side of the river. The access road would be routed as far away as practical from the rock knoll and construction activity where the north end of the dam meets the rock knoll would be limited to the minimum necessary to ensure that the dam is solidly anchored to rock.

Various powerhouse alternatives, with generation capacity ranging from 618 to 1,236 MW, and the number of turbines ranging from 4 to 6, were evaluated. The preferred alternative was a plant with a capacity of 824 MW i.e. 4 turbines each producing 206 MW. The EIS indicated that both Kaplan (variable pitch propeller) and simple fixed blade propeller turbines are suitable for the head range and water flow, and that there was no difference in them in terms of environmental effects (including low fish mortality rates).

Gull Island

The EIS indicated that four alternative sites between Gull Island and Grizzle Rapids were studied for the siting of the Gull Island Generation Facility. All four sites were considered technically feasible and to have few differences in terms of environmental effects. However, the Grizzle Rapids site was considered the best economic option and would be the preferred site for the dam, powerhouse and related infrastructure.

The EIS indicated that given the head and flow rates at Gull Island, Francis turbines were the only option for the powerhouse. Seven powerhouse alternatives, with generation capacity ranging from 2,000 to 2,520 MW, were evaluated. The number of turbines in the alternatives varied from 4 to 8 and the turbine runners varied from 5.7 metres to 7.6 metres in diameter. More turbines provide more control of the reservoir. Nalcor indicated that fish injury and mortality is directly proportional to the size of the runners. The preferred powerhouse alternative was five Francis turbines, each having a capacity of 450 MW (total 2,250 MW) and a runner diameter of 7.2 metres.

Project Interconnecting Transmission Lines

Nalcor considered two routes for the transmission lines. The preferred one was along the existing transmission line, but for additional flexibility, the overall right of way width was widened by 20 metres to 120 metres. The transmission lines from the Muskrat Falls site would cross the river upstream of the powerhouse and dam, and would be routed as far to the west as practical in order to minimize any disturbance of the rock knoll. No other technically and economically feasible alternatives were identified for the transmission line corridor for the crossing at Muskrat Falls.

Accommodations Complex

Nalcor indicated that, given the proximity of the Muskrat Falls site to Happy Valley-Goose Bay, an alternative to an on-site accommodations complex was to house the workers in Happy Valley-Goose Bay, possibly in the existing barracks in the 5 Wing Goose Bay Military Base. However, the on-site accommodation complex was preferred because it would significantly reduce adverse socio-economic effects on Happy Valley-Goose Bay and would be beneficial to Project construction activities. Nalcor indicated that because of the distance of the Gull Island site from Happy Valley-Goose Bay it considered no other alternative to the accommodations complex for that facility.

Construction Sequence and Pace of Construction

Nalcor stated that the current preferred construction sequence, Muskrat Falls followed by Gull Island with overlapping in construction, would not result in changes to the scope of the Project or the location of transmission lines, generation facilities, dam heights, areas of inundation, or power output, or the duration of discrete construction or operation activities as described in the EIS. However, it would require design modifications to reconfigure the main power transformer, switchyards and interconnecting transmission lines. There would also be adjustments in the design of the Muskrat spillway to accommodate the delayed flow regulation from Gull Island and adjustments in the design of the Gull Island diversion tunnels and cofferdam to accommodate the presence of the Muskrat Falls reservoir.

Nalcor evaluated three alternatives for the pace of construction: consecutive construction; concurrent construction with the same completion date; and staged overlap. All three alternatives were economically feasible but the rate of return for each differed. The preferred construction sequence had a 2-3 year overlap in construction of Muskrat Falls and Gull Island. Nalcor indicated that within three years of beginning construction of Muskrat Falls, it should have sufficient financial and market information to be able to determine when the Gull Island phase of the Project would proceed.

Nalcor considered the staged overlap as the best approach for mitigation of the boom and bust effect on the local economy and for management of workforce opportunity. This approach would also reduce mobilization costs, allow better use of temporary infrastructure such as accommodations complexes, while reducing costs, and would optimize use of the workforce and equipment. A year round construction schedule (rather than slowing the pace during the winter) would further reduce peaks and valleys in employment and construction activity.

Nalcor indicated that changes in economic conditions could alter the sequence and pace of construction and that development of either phase of the Project depended on an affirmative investment decision for that phase. Market access, sales and financing would be the three key considerations. Initially, emphasis had been on Gull Island first because its unit costs were lower. However Gull Island required substantially greater transmission capacity, a larger sales portfolio, and more construction capital than Muskrat Falls. Greater available transmission capacity would favor Gull Island first and lesser capacity would favor Muskrat Falls first. Similarly, strong sales of electricity would support proceeding with Gull Island first, less robust sales would support Muskrat first. If the availability of financing were easy, it would support Gull Island first; if more difficult, it would support Muskrat Falls. Cash flows from Muskrat Falls would help finance the more expensive Gull Island. From a technical perspective, the construction of either site first would not result in changes to the predicted environmental effects associated with each phase of the Project. The timing of the various components of each Project phase would be finalized at the time of detailed engineering.

Nalcor indicated that the preferred construction sequence would result in a peak average level of employment of 2,300 in year seven. With no overlap, the peak employment for Muskrat Falls would occur in year six with an average employment level of 1,660 people and for Gull Island it would occur in the fifth or sixth year after commencing its construction. Nalcor also indicated that if there were no overlap in construction at Muskrat Falls and Gull Island, there might not be significant enough economies of scale for local companies to invest the required capital to establish supply businesses and this would make them less capable of providing the required goods and services for the Project.

Nalcor stated a number of times during the hearing that the scope of the Project included both Gull Island and Muskrat Falls and both developments would be required to meet the purpose of the Project, which was to develop the full hydroelectric potential of the lower Churchill River in fulfillment of the Province's Energy Plan.

Reservoir Preparation

Nalcor presented environmental, technical and economic reasoning for three clearing scenarios: no clearing, full clearing, and partial clearing. The "No clearing" option would involve clearing only the trees and vegetation necessary to construct the generating facilities. "Full clearing" referred to the removal of all timber in the area to be flooded by the Project where it would be safe to do so and economically feasible. "Partial clearing" would involve clearing trees around the perimeter of the reservoir only except where it would be unsafe to do so. Nalcor stated that both partial and full reservoir clearing strategies were considered technically feasible, but concluded that the partial clearing option was the preferred and optimal option since it met the operational needs of the generating facility, the needs for accessibility and navigation, economic constraints and the environmental need of accelerating the formation of a riparian zone.

To help describe the proposed clearing scenarios, Nalcor defined three reservoir zones (Figure 7):

- ice zone: 3 metres above full supply level (to a maximum of 15 metres from the new shoreline) to 3 metres below low supply level;
- stick up zone: area below the ice zone where tops of trees extend into the ice zone; and,
- flood zone: area below the stick up zone where vegetation would be fully submerged after inundation.

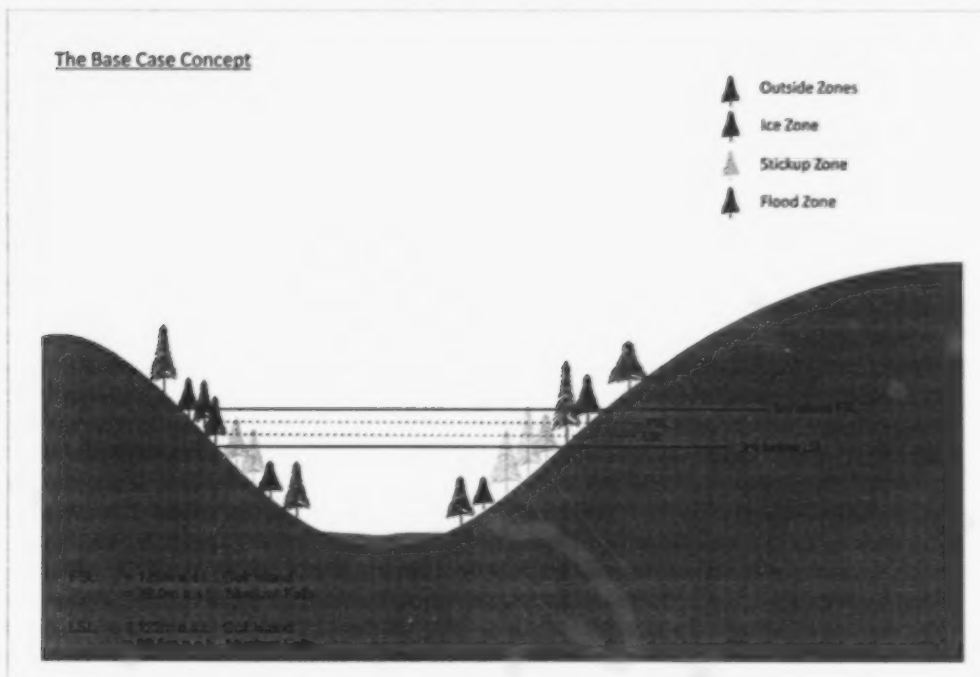


Figure 7. Three reservoir zones – ice zone, stick up zone and flood zone. (Source: Nalcor)

Partial Clearing

Nalcor's preferred partial clearing would involve clearing all timber from three metres below the low supply level of the future reservoirs to three metres above the full supply level, and 15 metres horizontally from the new shoreline, except where it would be unsafe to do so (Figure 8). Only trees defined as merchantable timber would be cut and tree trunks moved above the flood line. Limbs, tops and non-merchantable timber would be mulched at the clearing location. Mulching was the most technically feasible approach for slash disposal since material collection would not be required and the mulch would not float after impoundment. Moreover, the mulched material would constitute less than four percent of the total amount of material contributing to methylmercury production.

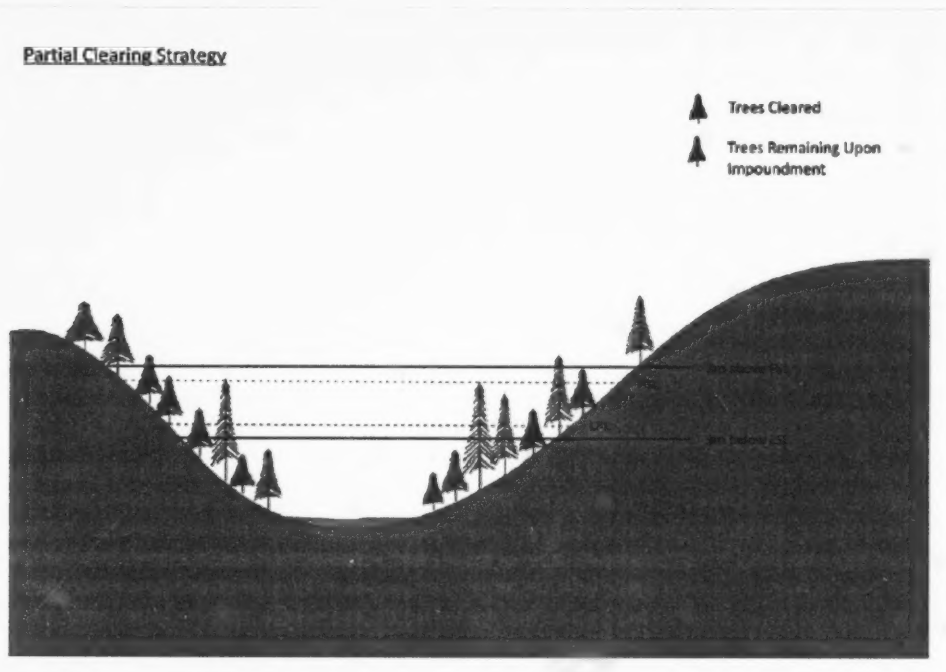


Figure 8. Partial clearing strategy (not to scale) (Source: Nalcor)

Nalcor stated that slopes greater than 30 percent would not be cleared because building access roads to remove the trees would be unstable and equipment used for mechanical clearing could slip on the upper horizons of soil, thus making clearing in these areas unsafe. Areas with slopes less than 30 percent but not accessible because the slope and ground conditions in the surrounding area would prevent the building of access roads were also excluded from clearing. These safety restrictions were determined in accordance with standard forestry practices in the area and consultation with the provincial Department of Natural Resources. Nalcor recognized that there were other methods to operate on steeper slopes, but concluded there would be safety and economic concerns with respect to those methods as well. Further, in areas with localized pockets of less than 30 percent slope, but greater than 10 kilometres from access roads, economic constraints of additional road building would prohibit clearing.

Applying this safety and accessibility analysis, Nalcor concluded that some areas in the stick up and ice zones in both the Gull Island and Muskrat Falls reservoirs would not be cleared.

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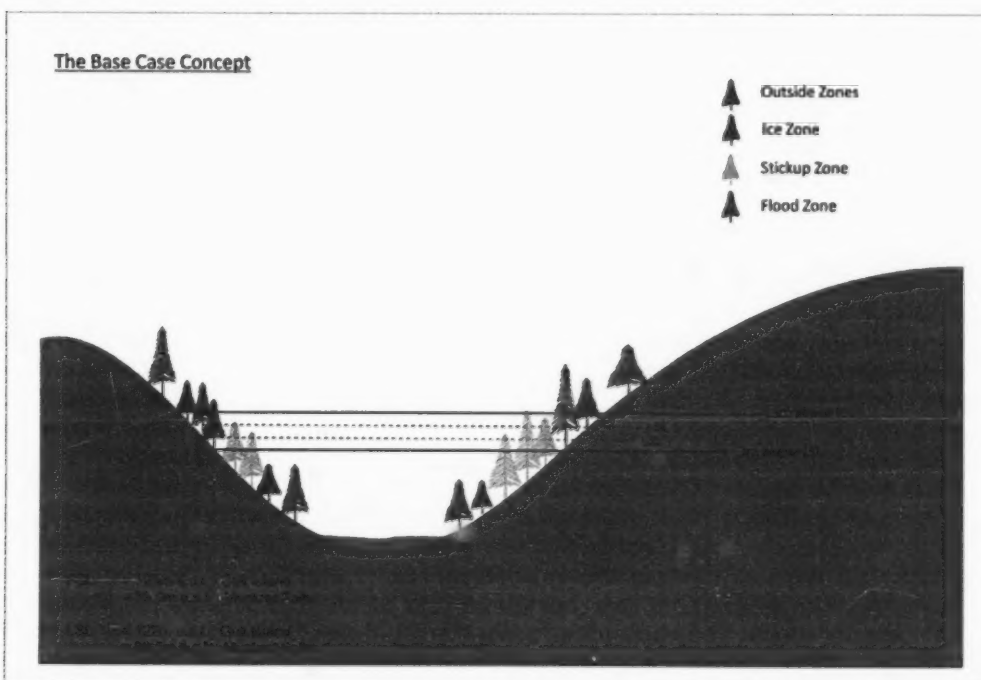


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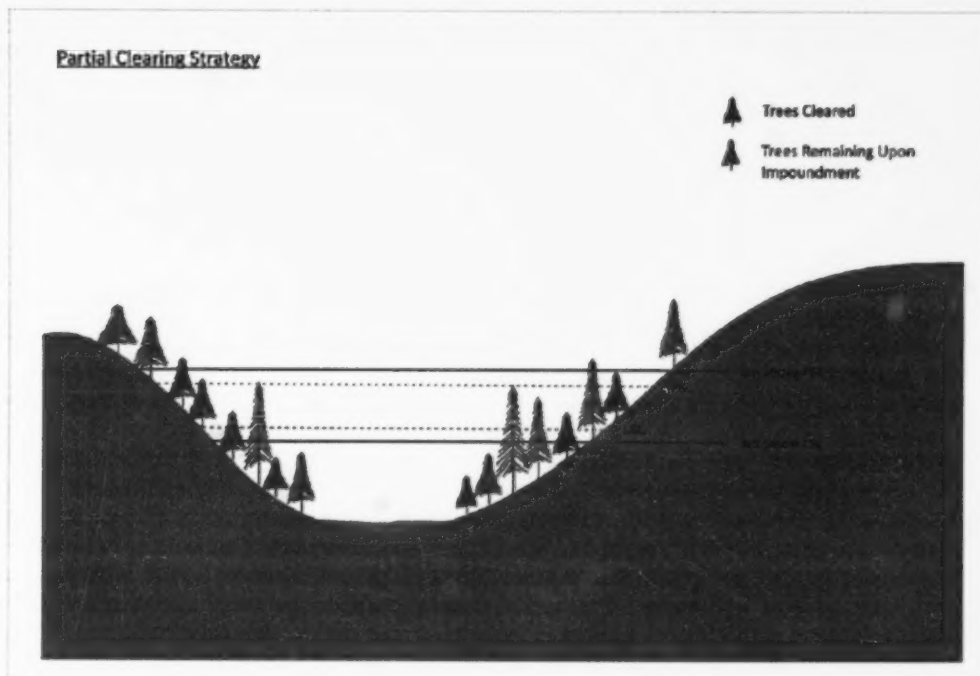


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Applying this safety and accessibility analysis, Nalcor concluded that some areas in the stick up and ice zones in both the Gull Island and Muskrat Falls reservoirs would not be cleared.

Clearing of the ice and stickup zones of the Gull Island reservoir would only be feasible for 291,000 cubic metres (20 percent) of the gross volume of timber. This volume would come from that portion of the reservoir near the Gull Island dam site, approximately one-third of the linear distance of the length of the reservoir (i.e. between the Gull Island facility and Lake Winokapau). Nalcor explained that there were extensive areas in the Gull Island reservoir where major deposits of sand with slopes in excess of 30 percent extend down to the existing shoreline. In the Muskrat Falls reservoir, Nalcor estimated that there was 445,000 cubic metres of merchantable and 56,000 cubic metres of non-merchantable timber in the ice and stick-up zones. Of the 445,000 cubic metres of merchantable timber, some 98,000 could not be removed due to safety or access considerations but additional volumes of timber would be added due to road construction (45,000 cubic metres), wood storage areas (8,000 cubic metres) and habitat enhancement (71,000 cubic metres). The resultant total merchantable volume was 471,000 cubic metres. For the non-merchantable wood, some 13,000 could not be removed due to safety/access but volumes would be added for road construction (6,000 cubic metres), wood storage areas (1,000 cubic metres) and habitat enhancement (9,000 cubic metres). The resultant total non-merchantable volume was 59,000 cubic metres.

Partial clearing would minimize trash and debris in the reservoir, enable potential shoreline usage by people, and ensure access to the reservoirs by wildlife. Partial clearing would also provide opportunity for wildlife and fish habitat development. As part of its reservoir preparation techniques, Nalcor would build main access roads between full and low supply level and, as a result, these areas would become fish habitat as the Project goes into operation.

Full Clearing

Full clearing refers to the removal of all timber, where it is safe and economic to do so, in the ice zone, stick-up zone and flood zone. Nalcor stated that such full clearing of all zones would be considered practical only where the reservoir area and depth were small (less than 30 metres). Full clearing would result in several adverse environmental effects, such as removing existing riparian habitat and generating additional air emissions. Further, not only would full clearing remove riparian vegetation that protects habitat from temperature increases during reservoir preparation, it would also create increased potential for erosion and sedimentation along the river banks. Finally, full clearing would result in substantially greater cost and would extend the construction schedule and therefore not be economically feasible.

While full clearing would remove more vegetation from the flood zone, Nalcor's modelling concluded that this clearing method would result in an approximately 10 percent reduction in mercury concentrations in the reservoirs and in greenhouse gas emissions. Nalcor's position was that removing soils from the future reservoirs to aid in reducing methylmercury production was not technically or economically feasible and would have considerable environmental effects. It also questioned the technical feasibility of relocating soils removed as part of reservoir clearing.

Nalcor added that while full clearing would result in additional employment, the cost of accessing the additional trees would far exceed typical harvesting costs and would outweigh the associated employment benefits. Its cost analysis confirmed that full clearing of the reservoir would not be economically feasible, as the cost of recovering the timber would exceed its value. Estimated additional harvesting costs for full clearing would be \$50 million and estimated additional labour requirements would be 40,000 person-days. In addition, there would be a significant cost penalty of at least \$200 million for delays in the construction schedule. The reservoir preparation plan stated that the sole economic benefit of reservoir clearing would be

the operations efficiency of the generating facility, not the recovery of marketable volumes of timber or other biomass.

Method of Clearing

Nalcor concluded that mechanical harvesting would be the safest and most economically feasible method of clearing. Manual harvesting systems would require a large number of workers working under dangerous conditions using chain saws and putting themselves at risk of personal injury, particularly during the delimbing phase and when working in inclement weather. It would not be economically practical for reservoir clearing due to the size of the areas to be cleared, scheduling constraints, the amount of labour required, and the building of additional roads to remove the timber.

Merchantable Timber

Nalcor stated that timber removal would not be a forestry operation but a reservoir clearing operation. Therefore, while there are potential opportunities with respect to merchantable and non-merchantable timber, transporting merchantable wood outside of the reservoir clearing areas for secondary use was outside the scope of reservoir preparation and would incur an additional cost that would not further the needs of the Project. Twenty designated storage yards for merchantable timber would be located outside of the reservoir limits and used as required. This merchantable timber would be available for removal by any party interested in utilizing it.

In response to a request from Innu Nation for full or "proper" clearing, Nalcor questioned the viability of Innu Nation's business plan to utilize the timber. Nalcor further stated that the cost per cubic metre of timber would be an order of magnitude greater than what a forest operator would expect to be competitive in today's market.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures related to reservoir preparation included the following:

- implement partial clearing of the reservoirs involving removal of timber from 3 metres below the low supply level to 3 metres above the full supply level;
- delimb trees where they are felled and mulch the slash;
- construct most access roads in the flood zone between full and low supply level;
- stockpile merchantable timber within the reservoir clearing areas above the flood zone for removal by a secondary wood processor; and
- use the 20 designated storage yards located outside of the reservoir limits on an as needed basis only.

4.3.2 Participants' Views

The Natural History Society suggested an alternative to the proposed two dam Project would be to have just one dam at Muskrat Falls but twice as high as the proposed dam. It felt such a structure would generate a considerable amount of electricity but leave an additional 100 kilometres of river unaffected by the Project.

The Protected Areas Association noted that the new transmission lines would run parallel to the existing transmission lines, but result in a wider right of way. This could result in more habitat fragmentation and could put more pressure on the Red Wine Mountain caribou herd because of increased access and hunting pressure.

Innu Nation suggested that it appeared to be technically feasible to move the transmission line off the rock knoll and that it could be technically and economically feasible to locate all or a portion of the road around the rock knoll in the river bed to further minimize impact on the knoll.

Natural Resources Canada determined that the methods Nalcor used to model the fate of mercury in the environment after reservoir clearing were appropriate. However, the EIS did not indicate whether Nalcor had considered the effectiveness of partial clearing. Furthermore, Nalcor did not assess removing the organic layer of soil or selective clearing of brush and other organics to reduce methylmercury production. Based on new information from experimental lakes, Natural Resources Canada recommended the removal of trees, brush and possibly soils in the drawdown zone between high and low water levels, as research indicated that this area would be the greatest contributor of methylmercury, thus supporting Nalcor's scenario of partial clearing. It stressed that brush containing foliage promotes bacterial growth and methylation and would be a greater contributor of methylmercury than wood. Natural Resources Canada recommended that Nalcor provide a strategy to discuss the feasibility, both economic and technical, of removal methods to reduce the production of methylmercury in flooded terrain. It further recommended that Nalcor study the baseline characterization of soils and vegetation within the potentially flooded terrain in the drawdown zone and the possible removal of both mercury and carbon-rich surface horizons in this area.

The provincial Department of Natural Resources stated that its goal would be to maximize production of solid wood products and full utilization of timber and resources from the Lower Churchill development. In regards to the flood zone that would not be cleared under Nalcor's proposed partial clearing, the Department of Natural Resources would have complete access to those areas to allocate forest operations there at the same time that Nalcor would be working elsewhere on clearing operations. The Department had called for expressions of interest for a sawmill and a biofuel facility in Central Labrador. However, maximum utilization and the feasibility of a forestry industry in Labrador is dependent on financial market conditions and viable markets did not currently exist for wood fibre products. The demand for wood pellets would likely eventually increase with rising prices of oil and future climate change policies. If, however, the Project proceeded without a viable market for wood fibres, clearing would still proceed to facilitate the development of the Project. Even if full clearing occurred, it would not have any effect on the Department's allowable annual cut as the Project's footprint is less than 0.5 percent of the forest management district.

The Department of Natural Resources recognized that the proposed reservoir clearing would not be a regular commercial harvesting operation as defined in its five-year plan, but would instead be a reservoir clearing operation only. Therefore, some guidelines of the *Forestry Act* would not apply as the ultimate goal is flooding not timber re-growth. It also made clear that the maximum 30 percent slope clearing limitation as presented by Nalcor was an operating guideline and the actual maximum slope would ultimately be defined by the operator.

Innu Nation stated that it would like to see the sustainable development of Labrador's forest resources. Innu Development Limited Partnership presented the economic development interests of Innu Nation of Labrador in regards to the clearing of timber from the Gull Island and Muskrat Falls reservoirs. It stated that it would like full or "proper" clearing of the reservoirs to facilitate a forest processing operation composed of a wood pellet manufacturing facility and/or a lumber/chipping mill. The proposed processing facility would require a significant (\$20 to \$30 million) capital investment and would ideally begin production by 2012. The operation would employ about 120 people directly, of which approximately 100 would come from the region. It clarified its preferred use of the term "proper" for reservoir clearing because full clearing as defined by Nalcor is misleading in that it doesn't mean clearing all the trees of the reservoir.

Proper clearing means clearing more trees than partial clearing, but not all the trees in the reservoir. Innu Nation stated that Nalcor needed to assume the costs of "proper" clearing of all timber in the reservoirs to support long-term employment in Labrador and the partial clearing option did not meet this socio-economic responsibility. In addition, Innu Nation stated that forest management plans had much more stringent policy goals for reservoir clearing, such as enhancing local employment from forest-based industries and minimizing merchantable wood wastage during timber operations, than proposed by Nalcor. It agreed that both partial and "proper" clearing are similar technically and environmentally, but questioned Nalcor's assertion that "proper" clearing was prohibitively more expensive than partial clearing and stated that the additional clearing would provide 16 full-time jobs for 10 years. It felt these additional jobs would mitigate against a boom and bust effect. In Innu Nation's point of view, only proper clearing would meet the provincial policy as described in the Ecosystem Management Plan for the district and the Province should ensure that this policy would be followed by Nalcor. Furthermore, it questioned the difference in the latest increased cost estimates between partial and proper clearing presented by Nalcor and stated that the additional cost for "proper" clearing would not be significant in terms of the cost to the overall Project. Because clearing of Gull Island might not occur until a number of years after the development of Muskrat Falls, Innu Nation stated that it was not appropriate for Nalcor to conclude that partial clearing for the Gull Island reservoir would be the only option as the state of financial markets at that time cannot be predicted. It further recommended that an independent third party re-analyse the feasibility of proper clearing at the time of Gull Island sanction.

A participant at the Sheshatshiu meeting stated that due to Nalcor's position that full clearing was too expensive and time-consuming, he now supported the scenario of partial clearing.

The Nunatsiavut Government stated that Nalcor must clear wood and brush within the reservoir boundaries to decrease methylmercury contamination within and downstream of the Project area. A number of participants questioned Nalcor's decision to only clear areas with less than 30 percent slope. One suggested that a winch and cable could access an area of greater than 30 percent slope where there is no road. Another participant questioned Nalcor's assertion that clearing slopes greater than 30 percent was not safe as he stated that equipment is available that functions on slopes much greater than 30 percent. He further noted that he did not want to see the cleared wood go to waste.

Sierra Club Atlantic concluded that full and partial clearing alternatives would leave substantial numbers of trees standing due to slope restrictions. It proposed that manual clearing with chainsaws and tree removal with drag line extraction would remove all merchantable and non-merchantable vegetation. Sierra Club Atlantic submitted a 1979 report from the Newfoundland Department of Forestry and Agriculture concluding that cable logging would be an economic and environmentally sound approach to timber removal in these circumstances. This approach would be more labour intensive, generate more merchantable volume and have greater socio-economic benefits for the region. Sierra Club Atlantic also asserted that this method would not require road building as Nalcor claimed, if the staging area remained on the upper slopes. It also rejected Nalcor's claim that full clearing would remove riparian habitat before the impoundment of the reservoirs. It suggested that a buffer be left around the river edge to provide adequate riparian habitat and be cleared only immediately before impoundment. Although Nalcor concluded that greenhouse gases and methylmercury contamination were virtually the same with full and partial clearing, Sierra Club Atlantic requested that Nalcor examine mechanical removal of duff or the organic layer of soil in the limited "partial" clearing zone in order to reduce greenhouse gases and mercury contamination.

In response to Sierra Club Atlantic, the provincial Department of Natural Resources stated that cable logging methods used in Western Canada may not be appropriate in Newfoundland and Labrador and that a cable logging scenario had not been presented to it for review. The harvesting scenario proposed by Nalcor was aligned with the harvesting methods that are used in the province. Ultimately, the Department would require Nalcor to comply with a management plan with very specific harvesting guidelines.

Grand RiverKeeper Labrador Inc. questioned the statistical accuracy of methylmercury modelling predictions for full or partial clearing. It expressed difficulty in understanding how removing only 43 percent of the total volume of timber in Gull Island and 73 percent in Muskrat Falls could result in modest reductions in peak mercury concentrations as compared with the full clearing scenario. It stated that if Nalcor has rejected possible mitigation measures to reduce methylmercury levels, such as the addition of selenium, then full reservoir clearing was the only strategy to achieve the best outcome and should be required. It stated that if full clearing of the reservoir was not economically feasible then the Project itself was not economically feasible. A participant asked Nalcor why they were not considering a co-generation plant to help support the forest industry in Labrador as well as use product and waste material to produce additional energy for the grid. He also stated that the wood that would be cleared under the partial clearing plan around the rim of the reservoirs would be of inferior quality, composed mainly of small stems, and that the highest quality wood would remain on the bottom of the reservoir in the flood zone. He further suggested that if the Province and Nalcor supported a pellet facility to handle waste then local businesses would be able to harvest the high quality wood in the bottom of the flood zone because there would also be a market for the waste.

A participant stated that full clearing of the flooded area should be done in order to facilitate economic opportunities for himself and others in the forestry industry of Labrador.

Grand RiverKeeper Labrador Inc. suggested that removal of the organic duff layer during reservoir preparation would reduce methylmercury levels, as well as create opportunity for a new industry producing material for heating and composting. It further suggested that if there were no markets for the cleared wood during the time of reservoir clearing that the Project should be delayed until a market emerges and no timber should be stockpiled. It also suggested that pellets produced from timber as a product of full clearing would not need to be exported to foreign markets because the local market for lumber and wood pellets would be adequate.

Sierra Club Atlantic stated that Nalcor should build and operate or even donate a pellet production facility to generate profit, create employment and social benefits, and demonstrate corporate social responsibility. The use of pellets cleared from the reservoirs could replace electric heat and would produce no net carbon emissions. It also suggested that peat and duff could be incorporated into the timber pellets.

4.3.3 Panel Conclusions and Recommendations

Nalcor considered a number of alternate means of carrying out the Project. Of these, the Panel has focused its attention on the construction sequence and pace, and reservoir preparation.

Construction Sequence and Pace

Nalcor's preferred option for construction sequencing and pace is to construct the Muskrat Falls generating facility and related interconnecting transmission lines first followed by the Gull Island generating facility with an overlap in construction. Since Muskrat Falls and Gull Island are

subject to separate sanction decisions there is uncertainty regarding the time lag between the two.

The Panel's approach has been to reflect Nalcor's preferred sequence and in some cases to recommend that lessons learned from the construction of Muskrat Falls be specifically factored into decisions regarding Gull Island. If for any reason Gull Island were to be constructed first, the same principle should apply.

Recommendation 4.4 Project sequencing and applying lessons learned

The Panel recommends that, if the Project is approved, and if for any reason construction of the Gull Island portion of the Project occurs before Muskrat Falls, Nalcor should be expected to apply the lessons learned from the construction of Gull Island to the construction of Muskrat Falls.

Reservoir Preparation

In reaching its conclusions on alternative means of reservoir preparation, the Panel considered the following factors to be particularly relevant:

- the two alternative means of reservoir preparation considered in detail by Nalcor, 'partial clearing' and 'full clearing';
- Nalcor's assessment of partial and full clearing;
- the different views of many participants regarding the amount of clearing that should be done, harvesting methods and Nalcor's cost benefit analysis;
- Natural Resources Canada's position that more in-depth analysis is required of different options, including soil removal, to reduce the uptake of methylmercury;
- Environment Canada's position that the methodology used by Nalcor to calculate greenhouse gas emissions is appropriate, that the greenhouse gas emissions from either option is small, and that the preferred option of disposal of slash (mulching) and its implications for methylmercury production is acceptable (Environment Canada's view is related in Chapter 5);
- the provincial Department of Natural Resources involvement in approving detailed harvesting plans and monitoring operations; its statement at the hearing that it considers this to be a reservoir clearing operation as opposed to a forestry operation under the provisions of the Forest Management Plan for the area;
- confusion surrounding the terminology used by Nalcor at various stages of the assessment and because Nalcor's approach to reservoir preparation changed so much during the assessment process;
- the fact that Nalcor's assessment, for the most part, considered the two reservoirs together with respect to harvesting methods and constraints, operating measures, and cost benefit analysis; and
- the need to address the differing views on the use of timber salvaged from reservoir preparation activities.

In an effort to summarize and clarify the different options discussed, the Panel notes that Nalcor evaluated several options for reservoir preparation, namely, minimal clearing, partial clearing and full clearing. Nalcor's 'partial clearing' alternative involves clearing trees in only the ice and stick-up zones around the perimeter of the reservoirs and only in areas in those zones that are within Nalcor's pre-defined safety, environmental and economic operating constraints; otherwise, the trees are left standing. Nalcor's 'full clearing' alternative involves, in addition to 'partial clearing', also clearing wood in the flood zone but again only in areas in that zone that

meet the same operating criteria as for 'partial clearing'. Contrary to what has been often stated, Nalcor's 'full clearing' does not mean removing all the trees. Recognizing this, Innu Nation's presentation at the hearing suggested using the term 'proper clearing'. In terms of actual clearing activity, 'proper clearing' and Nalcor's 'full clearing' are the same.

The Panel also notes that in both Nalcor options ('partial' and 'full'), only trees defined as merchantable timber would be cut. Mechanical harvesters would cut the trees and remove the limbs and tops. The de-limbed trunks would be moved to roadside by mechanical forwarders and from there by truck to the nearest storage site located above the flood line. Tree tops, limbs, and other vegetation in the area (non-merchantable timber) would be mechanically mulched. The mulch would remain on location in the area to be eventually flooded.

Further, Nalcor's stated objective for its current reservoir preparation plan is to reduce the amount of trash and debris that could affect operation of the turbines after impoundment. In respect to that objective, since the main source of trash and debris is the ice and stick up zones, it is Nalcor's assessment that there is no difference in the 'full' and 'partial' clearing options and only little difference between the two in terms of navigation, mercury produced, or greenhouse gas emissions. However, by Nalcor's assessment, there are huge differences in costs in that in addition to extra harvesting activity the additional time required for 'full clearing' would result in delay of the Project construction schedule, thereby incurring a large penalty estimated by Nalcor to be at least \$200 million. Consequently, Nalcor's preferred option is 'partial clearing'.

The Panel heard from many participants who disagreed with Nalcor's assessment and preferred reservoir preparation option. Many thought that technologies such as the use of manual harvesting with chain saws and by cable logging would enable more areas to be cleared and greater volumes to be harvested than projected by Nalcor. Some recommended clearing, to the extent possible, of all trees in the reservoir for the economic benefits of utilizing the salvaged wood, while others for the reasons of reducing methylmercury and the generation of greenhouse gas emissions. The Panel also heard a number of participants question Nalcor's cost benefit analysis, particularly with respect to the value attributed to salvaged wood and the penalty attributed to construction schedule delay.

The Panel notes that Nalcor's harvesting approach that utilizes mechanical harvesters, forwarders and mulchers is reasonable for a forestry operation of this size and nature.

The Panel also notes, as further discussed in Chapter 5, the more trees cleared, the more benefits accrue in terms of reducing methylmercury accumulation and greenhouse gas emissions, though gains may be small. The Panel also notes that Natural Resources Canada recommended that Nalcor study the removal of soils in the drawdown area to reduce the production of methylmercury in flooded terrain. This is discussed in Chapter 6.

Nalcor's assessment of these matters as well as its cost benefits analysis considered the two reservoirs together. However, it is clear that the Muskrat Falls reservoir is specific to the Muskrat Falls generating facility in that it is the only reservoir for that part of the Project. Similarly, the Gull Island reservoir is specific to the Gull Island generating facility. It is also clear that the two reservoirs are significantly different in terms of size, volumes and density of wood, steepness of slopes, distance from Happy Valley-Goose Bay, and timing.

The Panel concludes that for reservoir preparation purposes it is appropriate to consider the Muskrat Falls reservoir separately from the Gull Island reservoir because of the vastly different physical characteristics of the two and because they are subject to different sanction decisions.

The Panel found it necessary to prepare a simple table to help depict Nalcor's estimates of the timber volumes in the Muskrat Falls reservoir, and how the application of Nalcor's 'partial' and 'full' reservoir clearing options would affect those volumes (Table 1). As mentioned earlier, 'partial clearing' would see harvesting activity in the ice and stick-up zones only, whereas 'full clearing' extends harvesting activity to the flood zone as well.

In summary, Nalcor's 'partial clearing' option for the Muskrat Falls reservoir would harvest 347,000 cubic metres of merchantable timber and 43,000 cubic metres of non-merchantable timber. Applying Nalcor's 'full clearing' option would add an additional 126,000 cubic metres of merchantable timber and 15,400 cubic metres of non-merchantable timber. The merchantable timber would be moved to storage areas above full supply level and the non-merchantable timber would be mulched and remain on location.

Table 1. Muskrat Falls Reservoir – timber volumes in cubic metres

	Merchantable	Non-merchantable	Total
Total Reservoir	607,000	76,000	683,000
Ice and Stick-up Zones	445,000	56,000	501,000
- Not Harvested (either option)	98,000	13,000	111,000
- Harvested (Partial and Full)	347,000	43,000	390,000
Flood Zone*	162,000	20,000	182,000
- Not Harvested (either option)	36,000	4,600	40,600
- Harvested (Full option only)	126,000	15,400	141,400

*calculated by the Panel using same ratio as Nalcor used for Ice and Stick-up zones. All other information is from Nalcor's reservoir preparation plan.

In addition to the above volumes from direct harvesting activities in the reservoir, Nalcor states that it would harvest additional volumes during the indirect activities of road construction, clearing of storage areas, and habitat enhancement activities. It estimates those additional volumes to be 124,000 cubic metres of merchantable timber and 16,000 cubic metres of non-merchantable timber. The Panel notes that not all this additional volume is from within the area that would be flooded, but it is associated with the Muskrat Falls component of the Project.

In considering the above information, the Panel notes that the additional volume (merchantable and non-merchantable timber) cleared under the 'full clearing' option from direct reservoir harvesting activity would be 141,400 cubic metres. This would be approximately one-third more than the volume (390,000 cubic metres) cleared under the 'partial clearing' option, or about one-quarter more when the volumes from the indirect activities are added to the base (total 530,000 cubic metres). There may be some additional roads required in the flood zone but there would be no need for additional storage areas or habitat enhancement activities.

It is the Panel's view that the above estimates of the increase in volume associated with full clearing as opposed to partial clearing are good indicators of the related harvesting activity and

costs. The Panel therefore estimates that applying the 'full clearing' option to the Muskrat Falls reservoir would result in additional costs of no more than one-quarter to one-third more than for 'partial clearing' and related activities, and likely less. Further, with the current planned annual reservoir clearing activity level, the 'full clearing' option would add one additional year to the proposed four year schedule for 'partial clearing' in this reservoir. If modest additional resources were applied annually, the four-year schedule could be achieved. It is the Panel's position that with either of those two approaches, full clearing of the Muskrat Falls reservoir would not have any negative impact on the approximate seven-year construction schedule of the Muskrat Falls generating facility.

The Panel concludes that it is both technically and economically feasible to carry out 'full clearing' for the Muskrat Falls reservoir.

RECOMMENDATION 4.5 Full clearing of the Muskrat Falls reservoir

The Panel recommends that, if the Project is approved, Nalcor be required to apply its 'full clearing' reservoir preparation option to the Muskrat Falls reservoir.

The situation with the Gull Island reservoir is more complicated. It is much larger with longer perimeter distances characterized by difficult terrain and less dense (less economic to harvest) stands of timber. Nalcor's estimate of total volumes for the Gull Island reservoir is 1,283,000 cubic metres of merchantable timber and 192,000 cubic metres of non-merchantable timber. Of these volumes, Nalcor's 'partial clearing' option would harvest only 151,000 cubic metres of merchantable timber and 20,000 cubic metres of non-merchantable timber, all from the ice and stick-up zones.

With Nalcor's preferred sequencing, a decision with respect to the preparation approach for the Gull Island reservoir can await the time of the Gull Island sanction decision and can take into account the actual experience with the Muskrat Falls reservoir preparation. If for any reason preparation of the Gull Island reservoir were to proceed first, it would be very desirable for its preparation plan to increase the clearing activity and harvest volumes from those currently projected by Nalcor for that reservoir. A potential approach might include a combination of 'full clearing' in certain heavily wooded areas just up from the dam site and an extended 'partial clearing' in areas additional to those currently proposed.

RECOMMENDATION 4.6 Preparation approach for Gull Island reservoir

The Panel recommends that, if the Project is approved, the reservoir preparation approach for the Gull Island reservoir be finalized and approved by the provincial Department of Natural Resources at the time of the sanction decision for Gull Island. The approach should take into account lessons learned from the preparation of the Muskrat Falls reservoir and should make all reasonable effort to increase harvested volumes above those currently projected by Nalcor under its 'partial clearing' option for the Gull Island reservoir.

The Panel notes that additional volumes harvested by the application of the 'full clearing' option for the Muskrat Falls reservoir would mean additional harvesting employment.

Regarding the utilization of merchantable timber, the Panel notes from Table 1 that applying the 'full clearing' option to the Muskrat Falls reservoir would result in some 473,000 cubic metres of merchantable timber being harvested and moved to designated storage areas above the flood line. This number grows to 599,000 cubic metres when the merchantable timber from access road construction, storage area clearing, and habitat enhancement is added. It is Nalcor's

position that that no economic uses of the wood have been identified, that the wood in the storage areas is available to third parties at no charge, and that Nalcor's responsibility ends there. The Panel has heard different views but most support full utilization of the wood rather than leaving it to rot in the storage areas. The Panel concludes that the harvested timber be utilized because of the related socio-economic benefits and other environmental benefits as discussed in Chapter 5.

The Panel notes that, while there are many potential utilization options for consideration, it is not its intent to be prescriptive. In the final analysis, determining how to utilize the timber is the responsibility of Nalcor. Utilization of the merchantable timber would result in meaningful additional employment although it is difficult to quantify the amount without knowing actual uses.

The Panel notes that, in addition to the timber volumes (599,000 cubic metres) arising from direct harvesting activities as discussed above, Nalcor estimates that between 41,000 and 92,000 cubic metres of debris and trash would be removed from the reservoir after inundation. Options considered by Nalcor for disposing of this wood include burying, burning, commercial salvage, or making it available to a third party. However, there was no conclusion and more study is required. It is the Panel's view that much of this wood should be included in the utilization option chosen.

RECOMMENDATION 4.7 Utilization of merchantable timber

The Panel recommends that, if the Project is approved, Nalcor be required to ensure utilization of both the harvested timber from reservoir preparation and the merchantable wood taken from the reservoir as part of its 'trash and debris' removal program after impoundment. Nalcor would retain the right to determine how this would be achieved, but should work with relevant Provincial Government departments and third party commercial interests to identify options.

5 ATMOSPHERIC ENVIRONMENT

This Chapter deals with Project effects relating to the atmospheric environment including air quality, greenhouse gas emissions, noise, and climate change.

5.1 AIR QUALITY

5.1.1 Nalcor's Views

Nalcor stated that baseline air quality data were not available or needed because:

- the assessment area is a pristine natural environment;
- there are no major industrial emissions in the assessment area; and
- the Project would result in only minimal temporary localized air quality effects from construction equipment.

Air contaminants from Project activities would be produced by exhaust emissions from heavy construction equipment and fugitive dust in dry weather. Nalcor stated that, with the application of appropriate standard mitigation measures, ambient concentrations of air contaminants within the assessment area would exceed provincial air quality standards only infrequently. Nalcor therefore determined that this impact would not be significant.

Nalcor estimated air pollutant emissions from each type of construction equipment based on expected fuel consumption. Total air contaminants during construction on an annual basis were predicted to be relatively low and would not noticeably change ambient air quality. Fugitive dust and combustion gases from construction activities would be expected to settle and disperse within two kilometres of the source. If required during construction, Nalcor would monitor ambient air quality and deposition of dust at the edge of buffer zones and would address any complaints.

As recommended by Environment Canada, Nalcor stated that it would prepare Environmental Protection Plans for construction sites that would include measures to reduce dust and other particulates and minimize air emissions including those from construction vehicles. Nalcor would adhere to best management practices equivalent to those outlined in "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (May 2005, prepared by ChemInfo Services Inc. for Environment Canada).

Nalcor stated that transportation of people and materials to and from Project sites would result in some air pollutant emissions, but these would be low in magnitude compared to ambient air quality standards and would be spread out over a large area during several years. Accordingly Nalcor concluded that transportation emissions would be unlikely to substantially affect air quality in the assessment area.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to air quality included the following:

- incorporate in an Environmental Protection Plan measures to reduce dust and vehicle emissions from construction activities. Implement measures equivalent to those contained in

"Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities", as recommended by Environment Canada; and

- monitor ambient air quality and deposition of dust at the edge of buffer zones with annual reporting, if required by government regulators.

5.1.2 Participants' Views

Environment Canada recommended the implementation of best management practices to mitigate air quality effects.

Innu Nation considered that the return of air quality to regulatory limits would be inadequate for this pristine environment. Innu Nation also asked what air quality monitoring would be implemented and how mitigation measures would respond to this monitoring. Innu Nation also expressed concern about Project noise at camps and culturally sensitive sites.

5.2 GREENHOUSE GAS EMISSIONS

5.2.1 Nalcor's Views

During construction, greenhouse gas emissions from Project activities, mainly due to exhaust gases from construction equipment, were estimated by Nalcor to be approximately 1.0 million tonnes in total over 10 years. Based on the relative cost of construction of the two facilities, Muskrat Falls would account for about 45 percent of this total (0.45 million tonnes) and Gull Island 55 percent (0.55 million tonnes).

Nalcor stated that it would monitor greenhouse gas emissions during construction by tracking fuel consumption for all construction equipment. Nalcor determined that the alternative means of construction discussed in the EIS would not result in any measurable change in greenhouse gas emissions.

During operation, Project greenhouse gas emissions would be caused mainly by decomposition of organic matter in the reservoirs. These emissions were estimated to be approximately 10.0 million tonnes in total over 20 years with annual amounts of 1.0 million tonnes in year 2 decreasing to 0.1 million tonnes in year 20, which is a level similar to natural lakes. Based on the relative size of the two reservoirs, Muskrat Falls reservoir would account for about 33 percent of total emissions (3.3 million tonnes) and Gull Island reservoir 67 percent (6.7 million tonnes).

Nalcor estimated that its initial proposal for full reservoir clearing could reduce greenhouse gas emissions by about 10 percent or 1 million tonnes in total compared to its preferred option of partial clearing, mainly from the Muskrat Falls reservoir. The loss of forested land due to flooding would not represent the loss of a carbon sink, because unmanaged forests are considered neutral with respect to carbon sequestration. Nalcor has committed to monitoring greenhouse gas emissions from the Muskrat Falls and Gull Island facilities and reservoirs to verify predictions and quantify greenhouse gas emissions for potential carbon credits. Nalcor stated that it did not intend to offset Project greenhouse gas emissions.

With regard to greenhouse gas displacement in potential markets, Nalcor stated that the Project would eliminate the need for the Holyrood oil-fired generating facility and could potentially displace existing fossil-fuel generation in export markets. Greenhouse gas displacement in potential markets would only be known if and when the specific generation sources displaced could be identified. Nevertheless, Nalcor estimated that the Project could result in an annual

displacement of up to 11.5 million tonnes of greenhouse gas emissions from existing generation facilities and would make provincial energy supply 98 percent greenhouse gas free. Based on the relative output of the two generating plants, Muskrat Falls would account for about 27 percent of this potential (3.1 million tonnes per year) and Gull Island 73 percent (8.4 million tonnes per year).

Nalcor estimated the greenhouse gas displacement potential of the Project relative to a range of thermal electricity generation options. If the annual hydroelectric output of the Project displaced coal-fired generation, the resulting reduction in greenhouse gas emissions would be 16.9 million tonnes per year. The corresponding estimate for heavy oil would be 13.0 million tonnes per year, and natural gas combined cycle would be 6.0 million tonnes per year.

Based on three market portfolio scenarios, Nalcor estimated greenhouse gas displacement potential over 50 years of Project operation to range as follows: low 173 million tonnes, medium 328 million tonnes, and high 535 million tonnes. The medium scenario was based on the Project displacing Holyrood and combined cycle natural gas turbines in all markets. Compared to this, the low scenario included displacement of non-emitting nuclear generation in Ontario and the high scenario included displacement of coal-fired generation in the Maritime Provinces in place of some natural gas generation. The three scenarios indicate that the potential greenhouse gas displacement in electricity markets over 50 years could be 16 to 49 times greater than the Project greenhouse gas emissions.

Nalcor stated that, if the Project did not proceed, Holyrood would continue to operate and by 2030 it could be emitting greenhouse gas at levels of 1.1 to 3.0 million tonnes per year. Electricity from the Project would displace these emissions. Comparative greenhouse gas reductions of alternatives to the Project were not assessed because Nalcor determined that no alternatives could generate the full 3000 megawatts of power required to fulfill Nalcor's Project objectives in line with the 2007 Newfoundland and Labrador Energy Plan.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to greenhouse gas emissions included the following:

- limit Project greenhouse gas emissions by measures including: proper vehicle operation and maintenance, enforcement of speed limits, anti-idling policy, and no slash burning;
- monitor greenhouse gas emissions during construction by tracking fuel consumption for all construction equipment; and
- monitor greenhouse gas fluxes from the reservoirs.

5.2.2 Participants' Views

Environment Canada reviewed and accepted as reasonable Nalcor's analysis of greenhouse gas emissions, based on the information presented, and provided the following comments:

- Nalcor provided adequate responses to the Panel's information requests relating to greenhouse gas emissions;
- Nalcor's approach regarding the loss of carbon sinks was based on reasonable assumptions;
- the Project may have a beneficial environmental effect through its potential to offset greenhouse gas emissions elsewhere;

- it concurred with Nalcor's findings that there would be an insignificant difference in greenhouse gas emissions from the reservoirs between full and partial clearing;
- it had not considered wood utilization in reaching its conclusion on the difference between full and partial clearing;
- it concurred with Nalcor's findings that greenhouse gas emissions from the Project would be insignificant in relation to greenhouse gas emissions potentially displaced by the Project in electricity markets;
- it had not carried out its own analysis to quantify the greenhouse gas displacement potential; and
- it encouraged Nalcor to use best practices for: operation and maintenance of construction equipment, most fuel efficient equipment, and best quality fuels.

Faculty and staff from Memorial University pointed out the benefits of full clearing of the reservoirs to: reduce waste, utilize resources, reduce greenhouse gas emissions, reduce risk of oxygen deficiency in reservoirs, reduce mercury, and reduce damage to fishing gear.

Innu Nation advocated full (proper) clearing of the reservoirs and maximum utilization of the forest resource including providing timber for a proposed Innu-owned wood pellet plant and lumber mill, as described in Chapter 4.

Participants including Innu Nation, Sierra Club Atlantic and Grand RiverKeeper Labrador Inc. questioned Nalcor's assumptions that electricity demand and fossil-fuel generation would continue to grow in the North American electricity sector and that the Project would displace greenhouse gas emissions in these markets. The reasons given included aggressive electricity conservation and demand management programs in many jurisdictions, the emerging North American Cap and Trade System, and rapid development of zero-greenhouse gas renewable generation technologies.

Other Concerns raised by participants included:

- no estimate of greenhouse gas emissions from alternatives to the Project;
- underestimation of greenhouse gas emissions from Project activities;
- no measures to offset Project greenhouse gas emissions from fuel combustion and decaying vegetation in the reservoirs;
- loss of a forest carbon sink due to flooding; and
- loss of boreal forest and associated carbon credits.

5.3 NOISE

The effects of Project-related noise on the terrestrial environment, culture and heritage and communities are considered in Chapters 7, 11 and 13 respectively.

5.3.1 Nalcor's Views

Nalcor predicted noise levels and noise zones of influence due to various Project activities. Given the relatively quiet surroundings, sustained noise levels of 55 decibels during the day and 65 decibels at night would represent a zone of influence. The distances from source to attenuate noise to below these levels were estimated as follows:

- heavy truck traffic on access roads – 200 metres from the road;

- operation of typical groupings of construction equipment – one to two kilometres from the site; and
- blasting – two kilometres from source would only attenuate noise to about 90 decibels.

Nalcor identified and mapped noise levels at the Gull Island and Muskrat Falls sites. Based on worst-case conditions, noise generated in the immediate zone of construction would be attenuated from a high of approximately 75 decibels at the sites to less than 60 decibels within two kilometres. No residences exist within this zone and no mitigation would be proposed for human receptors. Nalcor stated that concern about noise would be mostly related to the interaction with wildlife.

Nalcor's proposed mitigation measure related to noise was as follows:

- mitigate noise from Project activities when baseline noise plus Project-related noise exceeds 75 decibels and when noise becomes an annoyance factor for a number of people.

5.3.2 Participants' Views

Health Canada reviewed Nalcor's analysis of noise levels associated with the Project. It recommended that traffic noise be monitored in the Hamilton River Road area and mitigation measures be taken for any annoying noise levels over 75 decibels, which could include: a community consultation program, limiting trucking activities to day-light hours, ensuring trucks are properly maintained with mufflers, and minimizing the use of engine breaks in residential areas.

5.4 CLIMATE CHANGE

5.4.1 Nalcor's Views

Nalcor predicted warmer temperatures and slightly higher rainfall amounts over the next 100 years due to climate change. Some changes to river flows could be detectable. No changes would be expected in ecological processes within the boreal and taiga ecozones. Nalcor predicted that climate change over the next century could affect inland regions more than the coast due to the moderating effect of the Labrador Sea. Cartwright could be slightly cooler in the spring and summer and warmer in the fall and winter. Happy Valley-Goose Bay could be noticeably warmer in the summer, fall and winter (5 degrees Celsius to 7 degrees Celsius) with less change in the spring. Increased rainfall was predicted (6 percent to 9 percent) with more tropical storms reaching the area in the summer and fall. Sea level rise at Goose Bay over the next century was predicted to be 0.5 metres.

At the request of the Panel, Nalcor incorporated the above climate change parameters in its ice dynamics modelling. Predictions were, subject to annual variability, that climate change effects could lead to a further one week delay in winter freeze-up and formation of the ice bridge to Mud Lake, in addition to the predicted two week delay due to Project effects. Nalcor pointed out that extreme temperature and rainfall events associated with climate change may increase the frequency of unsafe ice conditions for Mud Lake residents, whether or not the Project proceeds, as occurred in recent winters. As such, Nalcor predicted that Project effects on ice dynamics could be small compared to the increased natural variability expected as a result of climate change.

Nalcor committed that it would be responsible for any Project-related effects inhibiting the ability of Mud Lake residents to cross the river to their community and would take appropriate mitigative action. River crossing difficulties due to climate change impacts would be

government's responsibility. Nalcor acknowledged that it may be a challenge to separate Project effects from climate change effects in this regard.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to climate change included the following:

- implement adaptive measures as needed in response to predicted climate change effects on the Project, which could involve new flood procedures, water management practices or increasing spillway capacity;
- continue to work and partner with the Department of Environment and Conservation to determine the optimum approach and Nalcor's role in monitoring for climate change;
- carry out the following monitoring programs for Project-related effects, which would also provide long-term information on climate change effects:
 - remote monitoring systems to measure environmental conditions including: wind, precipitation, temperature, ice, reservoir and trash rack conditions, and tailrace levels;
 - an ice observation program to be carried out throughout the reservoirs, downstream of Muskrat Falls to the mouth of the Churchill River, and Lake Melville, including: timing of ice formation and break-up, area covered, and open water areas including ashkui;
 - satellite-based monitoring of ice progression and stability in the vicinity of Mud Lake and Happy Valley-Goose Bay;
 - monitoring of ice thickness at select locations on the river, including public advisories; and
- carry out research for the period 2009-2012 involving modelling of the effects of climate change on the hydrological cycle of the lower Churchill watershed.

5.4.2 Participants' Views

Residents of Mud Lake expressed concern that the warming effects of climate change and extreme weather could further delay the formation of the ice bridge across the river at the onset of winter, in combination with the two-week delay predicted as a result of the Project.

The Department of Environment and Conservation stated that there was good cooperation with Nalcor on monitoring programs. With regard to any extended transition period for Mud Lake residents, when crossing the river by snowmobile or boat is not possible, the Department acknowledged that it may be difficult to separate Project effects from climate change effects. While the Department may be able to offer technical advice and recommendations, it was uncertain whether any regulatory authority exists to implement adaptation measures in response to climate change impacts.

Other concerns about climate change raised by participants included potential flooding due to extreme weather events and dam failure.

5.5 PANEL CONCLUSIONS AND RECOMMENDATIONS

In reaching its conclusions on the atmosphere-related impacts of the Project the Panel considered the following factors to be particularly relevant:

- the importance of using best available technology in construction and harvesting equipment where possible;

- the importance of minimizing greenhouse gas emissions from the construction and operation of the Project;
- the potential for large scale greenhouse gas emissions displacement resulting from the Project;
- the uncertainties surrounding the greenhouse gas emission displacement benefits from the Project as proposed; and
- the changes to the climate system predicted for the project area over time, and the uncertainties surrounding the scale and nature of these changes.

Nalcor has acknowledged that emissions from the construction process, emissions from the operation and emissions from deforestation all contribute to the greenhouse gas emissions from the Project. In addition, there are emissions associated with the change in land use from a natural forest to a reservoir.

The Panel notes that greenhouse gas emissions from the Project would be significant if considered in isolation. There is considerable uncertainty over the extent of displacement of higher greenhouse gas emitting sources of energy; however, there is every reason to expect that Project emissions would be more than offset through displacement of higher greenhouse gas sources of energy. The displacement of emissions from the Holyrood facility, for example, if attributed to the Project, would more than offset emissions from construction and reservoir clearing. The greenhouse gas emissions from the Project are therefore not likely to be significant.

The Panel notes that air pollution is a localized concern. The main sources of air pollution are expected to be from quarry operations, concrete work, and related construction activities. These impacts are expected to be localized and temporary and are therefore not likely to result in significant adverse environmental effects.

The Panel notes that the Project would result in localized noise pollution, mainly as a result of various construction-related activities. The Panel further notes that the mitigation measures proposed by Health Canada, and accepted by Nalcor, are reasonable and should be implemented if the Project is approved. The effects of the residual noise on the terrestrial environment, culture and heritage and communities are considered in Chapters 7, 11 and 13 respectively. The Panel concludes that with the mitigation measures proposed, noise is not likely to constitute a significant adverse environmental effect.

With respect to climate change, the Panel notes that there was limited information provided on specific changes to the climate expected in the Project area. There is still considerable uncertainty in the scientific community about climate change impacts at a local level. The Panel concludes that based on the information provided, there is every reason to expect that the general trend will hold true for Labrador, meaning it is reasonable to expect some sea level rise, some increase in severe weather events, some change in precipitation and some increase in average temperature.

Coastal areas are expected to experience increased precipitation, whereas in-land areas are more likely to see higher temperatures and less precipitation. Overall, there is a high degree of certainty that the climate will change, but low certainty about exactly how it will change. Regardless of the specifics, the changes to the climate will inevitably result in gradually increasing additional stresses on natural systems in the study area.

The Panel concludes that the full utilization of harvested wood would reduce air pollution and greenhouse gas emissions, as the utilization of the wood can reasonably be expected to

displace air and greenhouse gas emissions elsewhere. If the wood is utilized for timber, for example, it will likely displace harvesting activities elsewhere. If it is used for space heating, it will displace emissions from the sources of energy it displaces.

Similarly, assuming the wood is utilized, maximum possible reservoir clearing would be preferable from an air emission perspective, as it displaces harvesting activities elsewhere. The view expressed by some that the emissions from clearing are additive assume no wood utilization. If fully utilized, the emissions from the clearing equipment would offset air emissions elsewhere, as the wood utilization would either displace harvesting related emissions elsewhere, or displace emissions from energy sources displaced as a result of the use of the wood. The Panel's conclusions on reservoir clearing and wood utilization in Chapter 4 take into account these implications for air quality and greenhouse gas emissions.

The Panel concludes that with appropriate mitigation the Project would not result in significant adverse environmental effects related to atmospheric issues. Air pollution and noise are appropriately mitigated and are localized and temporary in nature and therefore not likely to be significant. The greenhouse gas emissions from the Project while significant in isolation do not constitute a significant adverse environmental effect because the power produced by this Project would very likely displace more greenhouse gas emissions than the Project would cause.

RECOMMENDATION 5.1 Use of best available technology

The Panel recommends that, if the Project is approved, Nalcor be required to implement its mitigation commitments to minimize air pollution, noise and greenhouse gas emissions resulting from the Project. In addition, Nalcor should be required to use best available technology for any new construction and harvesting equipment purchased for the Project. This means that any new equipment purchased after Project approval should be required to meet the highest current emissions standards for such equipment, even if such standards are above current regulatory requirements.

Potential Benefits

The Panel concludes that greenhouse gas emission reductions are a potential global benefit. This benefit could also be experienced nationally and provincially, particularly if there are firm emission reduction targets set in these jurisdictions. Some jurisdictions already have emission reduction targets in place. One affected jurisdiction, Nova Scotia, has in place a mandatory limit on greenhouse gas emissions from power production.

Nalcor provided a low estimate of 173 million tonnes, a medium estimate of 328 million tonnes, and a high estimate of 535 million tonnes for the total greenhouse gas emissions displaced by the Project over 50 years of operation. These estimates provide a good overall picture of the greenhouse gas emission reductions that could be attributed to the Project if it were to proceed. The determination of the exact greenhouse gas emission reductions attributable to the Project is, however, complex and highly uncertain. Some of the uncertainties relate to the range of possible markets for the power. The Panel has no reliable information, for example, on what the power from the Project will displace in markets beyond Newfoundland and Labrador and Nova Scotia.

Other sources of uncertainty relate to the methodologies applied to attribute emission reductions. As noted in Chapter 4, it is unclear, for example, how much of the avoided emissions from Holyrood should be credited to the Project in light of the likelihood, given oil

price projections and pressure to reduce greenhouse gas emissions, that a combination of demand management measures, and wind and small scale hydro production will be utilized to reduce or eliminate the use of Holyrood in the future if the Project does not proceed. Standard methodologies will likely not be developed until there are mandatory carbon markets in place in the jurisdictions involved.

In light of this, the Panel has considered the issue of greenhouse gas displacement for Muskrat Falls in three parts, displacement in Newfoundland and Labrador, displacement in Nova Scotia, and displacement in markets for the remaining power from Muskrat Falls. For Newfoundland and Labrador, the main opportunity for displacement appears to be the emissions from Holyrood. Given the firm commitment to stop generating electricity at the Holyrood facility, there is a reasonable degree of certainty about the displacement of greenhouse gas emissions from Holyrood.

The main question, unanswered because of the inadequate consideration of alternatives by Nalcor discussed in Chapter 4, is whether some or all of these emissions would be displaced through other means if the Project does not proceed, such as some combination of small-scale hydro on the island of Newfoundland and Labrador, wind power, and demand management. If the emissions from Holyrood would be partially or completely displaced by such measures without the Project, it is not appropriate to attribute the whole benefit of displacing emissions from Holyrood to the Project.

With respect to the block of power from Muskrat Falls designated for Nova Scotia, there is no clear evidence on whether the power exported to Nova Scotia and beyond would replace higher greenhouse gas energy sources, or whether it would displace wind, conservation, demand side management, etc. It seems reasonable to assume that the power would have some beneficial effect on greenhouse gas emissions in Nova Scotia. The complicating factor with Nova Scotia is that no evidence was presented to the Panel on whether the greenhouse gas emission targets in Nova Scotia can or will be achieved without Muskrat Falls, and whether more stringent targets will be set in Nova Scotia if Muskrat Falls proceeds.

There was very limited information provided to the Panel on the impact of the Muskrat Falls power on available markets in Nova Scotia, New Brunswick, and New England. Overall, there is significant potential for the power from Muskrat Falls to displace greenhouse gas emissions from coal power plants. However, unless the power is sold specifically to displace fossil fuel based power production in these markets, there is also a risk that the power would displace demand management, conservation and wind energy in those markets.

For Gull Island, there is a higher potential benefit in terms of the displacement of greenhouse gas emissions. However, as proposed, there is no guarantee that these benefits would be realized. The Panel was not provided with any specific information about markets for the Gull Island power, so no detailed consideration of the potential for the Gull Island power to displace higher greenhouse gas electricity was possible. The Panel did hear, however, that there is aging coal power production capacity in Ontario and some US states accessible through Quebec, so the opportunity to ensure the Gull Island power displaces higher greenhouse gas emission electricity production appears to be available.

The Panel concludes that the opportunity to displace greenhouse gas intensive power is one of the great potential benefits of the proposed Project. How much of this potential is realized depends on the markets the power is sold into, whether it explicitly replaces coal-based power production, and whether the potential of utilizing the power from this Project to back up wind generation and other intermittent renewable power production is maximized.

Duration of Benefits

Depending on the methodology applied to attribute greenhouse gas emission reductions, the benefits would be expected to endure for as long as the facility remained in operation. However, it is not clear when higher greenhouse gas sources of electricity displaced by the Project would be displaced by other low greenhouse gas sources of electricity in the future. This makes it difficult to assess the duration of the benefits from the Project.

Locally, for example, in 2041, power from Churchill Falls will be available to meet Newfoundland and Labrador demand. However, from a North American perspective, as long as the power from Lower Churchill does not displace conservation and demand management by reducing the price of electricity in affected markets, it should continue to make an overall contribution to reducing greenhouse gas emissions from electricity production for as long as it continues to operate.

The Panel concludes that there are important opportunities to enhance the greenhouse gas emission benefits of the Project. Maximizing the clearing of organic material in the reservoir before impoundment would reduce the greenhouse gas emissions from the operation of the reservoirs. Manual harvesting and the use of best available technology can further reduce greenhouse gas emissions from the construction phase. Most importantly there is considerable potential for benefit enhancement by ensuring the use of the power so that it replaces as much as possible high greenhouse gas sources of power and that its potential to back up intermittent renewable power such as wind be maximized either in Newfoundland and Labrador or in the receiving jurisdictions.

RECOMMENDATION 5.2 Backing up intermittent renewable energy

The Panel recommends that, if the Project is approved, Nalcor be required to make all reasonable efforts to maximize the potential to utilize power from the Project to back-up wind power and other intermittent renewable sources of electricity. The results of Nalcor's efforts should be reported to the public through its annual report.

RECOMMENDATION 5.3 Displacement of high greenhouse gas energy sources

The Panel recommends that, if the Project is approved, Nalcor be required to take all reasonable steps to ensure that power from the Project is used to displace energy from high greenhouse gas emission sources and does not displace demand management, conservation, efficiency, and the generation of power from renewable, low greenhouse gas emission energy sources. The results of Nalcor's efforts should be reported to the public through its annual report.

Monitoring, Follow-up and Adaptive Management

While the atmospheric effects of the Project, such as effects on air quality, greenhouse gas emissions, and noise are not likely to be significant, the environmental assessment raised a number of important issues that require ongoing monitoring. Furthermore, there is still some uncertainty about the extent of the effects and the effectiveness of mitigation measures. The Panel has therefore considered the need for ongoing monitoring, reporting, follow-up and adaptive management with respect to atmospheric issues.

RECOMMENDATION 5.4 Atmospheric monitoring

The Panel recommends that, if the Project is approved and in addition to its monitoring commitments, Nalcor should carry out the following monitoring programs using methodologies approved by federal and provincial regulators:

- monitor greenhouse gas emissions related to construction;

- monitor greenhouse gas emissions related to operation;
- track the displacement of greenhouse gas emissions in the various markets for Project power and report annually based on transparent methodologies approved by federal and provincial regulators, taking into account relevant issues identified by the Panel; and
- work with appropriate government agencies to ensure that there are active climate change monitoring programs on appropriate rivers in Labrador not affected by the Project, so that there is a better chance to separate Project impacts from climate change impacts based on local weather data collected within the Project area.

6 AQUATIC ENVIRONMENT

Nalcor used fish and fish habitat as the main indicators to assess the effects of the Project on the aquatic ecosystem, dividing effects into three categories: change in habitat quantity and quality; change in fish distribution and abundance; and change in fish health.

Key issues that emerged from the review process were:

- the effects of reservoir preparation and the timing and process of impoundment;
- changes in water quality in the reservoirs, particularly during the lengthy transitional stage before stabilization;
- injury and mortality to fish caused by entrainment;
- the fate of methylmercury in reservoirs;
- the effect of permanent loss or alteration of fish habitat and how effective Nalcor's proposed compensation strategy would be;
- possible changes to overall aquatic biodiversity and ecosystem resilience and the fish assemblage in particular through the extended transition period and beyond;
- downstream effects below Muskrat Falls and the likelihood that Project effects, including bioaccumulation of mercury, would be seen in Goose Bay or Lake Melville; and
- follow-up and monitoring.

6.1 RESERVOIR PREPARATION, IMPOUNDMENT AND OPERATING REGIME

6.1.1 Nalcor's Views

Nalcor considered several different reservoir preparation options as described in Chapter 4, and indicated that its preferred option - partial as opposed to full clearing - would strike the best balance between safety, environmental and economic concerns. Nalcor acknowledged that the amount of vegetation flooded during impoundment would influence various aspects of water quality in the reservoirs, including methylmercury and nutrients, but stated that environmental effects on fish and fish habitat were anticipated to be minimal, regardless of the selected clearing option considered.

Impoundment

In order to fill each reservoir, Nalcor would have to hold back a portion of the downstream flow. Nalcor committed to release at least 30 percent of the mean annual flow of the river, termed the "compensation flow", downstream of each dam to maintain downstream habitat for fish during the impoundment process. Based on historical flow data for the lower Churchill River, the proposed compensation flows would be well within the natural long-term variation in water levels. With regard to the filling rate, Nalcor stated that it would consider the suggestion to fill the reservoirs in a step-wise fashion in order to minimize fish strandings during the dewatering process. Nalcor indicated that it would have good control over the flows during impoundment and could deal with any unexpected fish habitat problems encountered downstream by changing the amount released through the spillways. Therefore if a 30 percent compensation flow was too low, it could be increased.

To address the concern by Fisheries and Oceans Canada of possible fish strandings downstream of the reservoirs during filling, Nalcor developed a fish moving and relocation plan.

Effects on both the aquatic and the terrestrial environments would depend on the time of year chosen for impoundment and filling rate. The timing and duration of reservoir drawdown could potentially affect fish habitat and fish downstream from the dam by exposing incubating fish eggs to drying or freezing, or reducing the habitat preferred by fish for their growth and feeding. Table 2 shows the sensitivity of different life stages of fish species in the lower Churchill River relative to timing of reservoir filling.

Table 2. Sensitive life history stages of fish species during reservoir impoundment
(Source: Nalcor)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ouananiche												
Brook Trout												
Lake Trout												
Lake Whitefish												
Round Whitefish												
Northern Pike												
Lake Chub												
Longnose Dace												
Pearl Dace												
Longnose Sucker												
White Sucker												
Burbot												
3-spine Stickleback												
Sculpin												

Low Interaction
Moderate to High Interaction (s – spawning; i – incubation; h – hatching)

Fisheries and Oceans Canada identified a period from mid-July to mid-September as the preferred time from an aquatic perspective but Nalcor identified a slightly longer period from August to October in order to address terrestrial concerns as well. Information on terrestrial effects associated with impoundment is presented in Chapter 7. Nalcor stated that its detailed construction schedules would provide a high degree of certainty that impoundment would occur in the preferred time period, but that it needed the flexibility to adjust the timing if needed. A worst case scenario could include the possible loss of an entire year-class of several species but in any case an authorization would be required under *Fisheries Act* Section 35(2).

Nalcor indicated that additional mitigation could be implemented if the optimal filling window was missed, including reducing or increasing the filling rates as required, and committed to consult with appropriate regulators several months in advance to ensure that effects would be minimized. Consequently, Nalcor predicted that impoundment would not result in a significant adverse effect, whether it occurred within or outside the preferred period.

Operating regime

Nalcor would maintain both reservoirs as close to full supply level as possible year-round with most of the storage regulation, and associated water level changes, remaining in the Churchill Falls reservoir. This would be assisted by the terms of the Water Management Agreement which requires both Nalcor and Churchill Falls (Labrador) Corporation Limited to collaborate to ensure efficient use of the river's power potential.

Weekly fluctuations would be in the order of 0.5 metres in the Muskrat Falls reservoir and one metre in Gull Island and daily fluctuations would be in the order of centimetres for both. The reservoirs would not be drawn down during times of peak demand. Nalcor characterized this approach as “water in – water out”, meaning that post-Project river flows downstream of Muskrat Falls would be largely unaltered. This type of operating regime would avoid the fish habitat and riparian zone problems of extensive drawdowns experienced in the Smallwood Reservoir and as a result a stable shoreline should eventually develop. Nalcor was also looking at further optimization of flows for ecological purposes, particularly in Muskrat Falls. This would see an expected half metre to one metre increase above the full supply level in the spring of the year, to mimic spring freshet for a number of weeks since the spring peak was expected to occur earlier and be smaller after impoundment.

Nalcor stated that it would address issues related to the risk of fish eggs being exposed and dried out during the annual spring drawdown through its habitat compensation plan.

Nalcor predicted that a change in Project sequencing would not alter the footprint or extent of the reservoirs and, as such, environmental effects management described in the EIS was still relevant and applicable. It stated that construction of the Muskrat Falls facility first would result in fewer impacts on fish and fish habitat than doing Gull Island first since reduction in flows associated with filling of the Gull Island Reservoir would not negatively affect downstream fish habitat from the facility if the Muskrat Falls Reservoir were already in place at that time.

Proposed Mitigation Measures and Monitoring

Nalcor’s proposed mitigation measures related to reservoir preparation, impoundment and operating regime included the following:

- schedule impoundment of the reservoirs for the period between August and October;
- minimize the effects if inundation occurs at another time of the year by means of higher compensation flow and slower reservoir filling;
- maintain a compensation flow during impoundment of at least 30 percent of the mean annual flow;
- mitigate fish strandings downstream during impoundment by releasing additional water downstream and by relocating stranded fish;
- operate the Gull Island and Muskrat Falls reservoirs as close to Full Supply Level as possible to maximize power output and minimize adverse environmental effects;
- draw down reservoirs to the low supply level to capture the spring melt;
- ensure the flows in the river do not fall below historic levels during operations; and
- monitor possible fish strandings downstream of the reservoirs during impoundment.

6.1.2 Participants’ Views

Participants expressed concern that selection of partial over full reservoir clearing would negatively affect fish and fish habitat through increased levels of suspended solids, nutrients such as phosphorus, and methylmercury. Some participants stated that Nalcor had not adequately weighed the environmental cost versus the economic benefits in its approach to how and when impoundment would occur.

Fisheries and Oceans Canada recommended that Nalcor carry out its reservoir impoundment between mid-July and mid-September to minimize the effects of reduced flows on spawning fish, eggs and young fish downstream of the dams. It also suggested that, prior to project

construction; Nalcor should collect more thorough information on the spawning, incubation, hatching and emergence of fish in the lower Churchill River system to add to the information from the scientific literature. Fisheries and Oceans Canada recommended that Nalcor develop and implement plans to identify downstream areas of the river where fish might be stranded during the impoundment process, and if necessary, relocate them and that Nalcor seek an authorization from Fisheries and Oceans Canada for potential lost fish during dewatering. Participants suggested reducing the downstream flow gradually during the impoundment process, starting at perhaps 50 percent initially while watching for shallow spots and potential fish stranding areas.

Sierra Club Atlantic and Grand RiverKeeper Labrador Inc. recommended that Nalcor be required to adopt an approach to water regulation more reflective of natural seasonal flows, known as environmental flow release, during the operation phase because this approach would result in improved shoreline conditions and better riparian and aquatic shallows habitat. They also suggested that minimum and maximum flows from Churchill Falls should be regulated through legislation to avoid a situation where Nalcor would be unable to maintain water levels and releases required for environmental protection. Some Aboriginal groups stated that the operating regime described by Nalcor would not provide for even a modest spring flood event within the reservoirs, which could result in reduced biodiversity. Participants also noted the importance of spring flooding events and their impact on nearshore biological processes. The Natural History Society gave the example of the Gulf of St. Lawrence where a 20-30 percent reduction in nutrients entering the river in spring was experienced due to damming of rivers. It also noted that fish spawning coincided with spring floods and nutrient availability.

Fisheries and Oceans Canada agreed with Nalcor's assessment of a minimal difference between different project sequencing scenarios on fish habitat. It did note that a decrease in water level or flows during impoundment of the Gull Island reservoir could impact some of the newly establishing near-shore fish habitat in the Muskrat Falls reservoir. It recommended that Nalcor's fish habitat compensation plan address effects in the two reservoirs independently so that each reservoir is compensating for negative effects in that reservoir regardless of when it is constructed.

6.1.3 Panel Conclusions and Recommendations

The Panel observes that the Project would subject fish in the lower Churchill River to a number of changes and stresses over a long period of time, which makes it all the more important that the effects of reservoir construction, including impoundment, at the start of the process should be minimized. The Panel concludes that impoundment outside of the preferred period would expose sensitive life stages of several fish species to unacceptable risk, with no clear evidence of effective mitigation, and that this would therefore constitute a significant adverse effect. However, the Panel also concludes that Nalcor's proposed four-part mitigation, including only impounding during the preferred period, would effectively mitigate this adverse effect.

The Panel notes that Nalcor and Fisheries and Oceans Canada would be able to apply lessons learned from the Muskrat Falls impoundment experience to refine this mitigative approach for Gull Island.

The Panel appreciates that Nalcor would like the flexibility to impound at a different time of year to avoid financial losses if construction schedules are not met. However, the Panel is confident that Nalcor would have sufficient lead time to address this issue and that tools are already available to ensure that this important milestone could be met on time.

RECOMMENDATION 6.1 Timing of reservoir impoundment

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to carry out impoundment of both the Muskrat Falls and Gull Island reservoirs during the period mid-July to the end of September, and to prepare a detailed mitigation plan for approval by Fisheries and Oceans Canada. The mitigation plan should include information on how the effects of dewatering would be monitored, thresholds to trigger further mitigation, and identification of specific adaptive management measures and how they would be applied.

The Panel acknowledges that the Lower Churchill Project would manipulate reservoir levels and interfere with downstream flows to a lesser extent when compared to many hydroelectric projects, and that Nalcor believes that this factor alone would minimize adverse environmental effects. Nalcor has also committed to the use of compensation flows during impoundment and opened the door during the hearings to the possibility of manipulating water levels to a certain extent to help re-establish the riparian zone. However, the Panel notes that the operating regime has been established primarily to maximize power generation, and that any environmental benefits, such as avoiding problems associated with large drawdown zones, are largely incidental. The Panel was also not presented with any evidence that indicated that the Churchill Falls project was operated with any environmental objectives or constraints or that the Water Management Agreement requires the parties to consider values other than revenue generation through power sales.

The Panel was presented with information on environmental flows, the basic concept being that when there are competing uses of a river, water must be deliberately allocated to ensure the maintenance of healthy ecosystems. This involves addressing magnitude, frequency, duration, timing, and rate of change. An environmental flow approach would also address aspects relating to conserving or re-establishing riparian habitat (see Chapter 7). Nalcor indicated its willingness to consider modifying the operating regime in order to assist the development of the new riparian zone, after impoundment, and also address the requirement to maintain minimum depths over newly created fish habitat. These are both examples of the types of considerations that would be addressed by environmental flow analysis.

The Panel observes that ideally an environmental flow analysis and planning process would be carried out for the entire Churchill River system and the necessary adjustments made to the operating regimes for both the Churchill Falls project and the proposed Lower Churchill Project, in order to remediate some of the adverse habitat effects in the Smallwood Reservoir identified during the review process. The Panel acknowledges that matters pertaining to the management of the Smallwood Reservoir are outside the Panel's mandate but puts forward this suggestion for consideration by the provincial Department of Environment and Conservation.

RECOMMENDATION 6.2 Environmental flow standards

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation, in consultation with Fisheries and Oceans Canada, Nalcor, Churchill Falls (Labrador) Corporation Limited, and Aboriginal groups and stakeholders, develop environmental flow standards for the lower Churchill River with respect to flows (magnitude, frequency, duration, timing, and rate of change) designed to promote the maintenance of ecological functions and the conservation of riparian and fish habitat. The environmental flow standards should be incorporated by regulation under appropriate provincial legislation and acknowledged in the Water Management Agreement. The Panel further suggests that the Department of Environment and Conservation consider developing environmental flow standards for the upper Churchill

River, recognizing the importance of addressing the entire watershed as an integrated system.

6.2 WATER QUALITY EFFECTS IN THE RESERVOIRS

6.2.1 Nalcor's Views

Nalcor addressed the following water quality parameters: total suspended solids, nutrients (specifically phosphorus) and temperature. Nalcor also discussed the effects of water quality changes on primary and secondary productivity.

Suspended Solids

Nalcor indicated that the source of suspended solids is related to reservoir preparation and inundation and following impoundment, eroding shorelines would cause increased levels of suspended solids in the water, which in turn could reduce light penetration and plant growth, and cause siltation that could damage fish habitat and affect fish in the early life stages.

Nalcor predicted that increased suspended solids would be most pronounced in the Muskrat Falls reservoir because of the sandy substrate and erodible shorelines. The shoreline erosion in the Muskrat Falls reservoir would result in an annual pulse of suspended sediment into the river ranging from 1.3 to 77 milligrams per litre. Highest levels would occur during the first year after impoundment and could be as high as 30 milligrams per litre above the normal baseline levels within the lower reach of the Muskrat Falls reservoir. Suspended solid concentrations would decline to below five milligrams per litre above baseline levels within seven years and two milligrams per litre after 20 years. While the predicted increases would exceed Canadian Water Quality Guidelines for the Protection of Aquatic Life that state that long-term increases should not exceed five milligrams per litre over baseline, Nalcor said that the guideline was not applicable to the lower Churchill River because the baseline levels of suspended solids were so variable. Nalcor acknowledged the potential for mass slumping events in the Muskrat Falls reservoir but predicted that the effects on suspended solids would be localized and minor.

In the Gull Island reservoir where the shoreline is much less prone to erosion, the peak total suspended solids would be less than one milligram per litre above baseline.

Overall, Nalcor stated that at no time would the increased levels of suspended solids reach a point where they would affect the functioning of aquatic organisms in the river.

Phosphorus

Nalcor stated that decomposing vegetation in the flooded area would add diverse nutrients to the water. Total phosphorus is the nutrient most associated with productivity of freshwater aquatic systems. Typically, its low availability limits the growth of aquatic plants (including phytoplankton), which in turn limits other parts of the food chain dependent on plant production.

Nalcor's modelling predicted that total phosphorus concentrations would initially increase in the Muskrat Falls reservoir from an average of 0.023 milligrams per litre to a peak of 0.99 milligrams per litre at the lower end of the reservoir, which in turn could result in a trophic surge (rapid increase in productivity at all levels of a food chain). However, Nalcor noted that modelling did not take into account any vegetation clearing during reservoir preparation and concentrations would be somewhat lower with partial reservoir clearing and more so with full clearing.

Between the Churchill Falls power station and the Gull Island generation station, total phosphorus levels were expected to increase to between 0.013 and 0.041 milligrams per litre in the first two years, an approximate four-fold increase from the typical background concentration of 0.01 milligrams per litre. However, this increase was not anticipated to affect the overall food web due to the rapid flushing rate of the reservoir.

Nalcor predicted total phosphorus concentrations in all sections of the river would be similar to current baseline concentrations eleven years after inundation.

Water Temperature

Using values based on both literature and field sampling, Nalcor's modelling predicted maximum and minimum water temperatures would stay the same but the timing of temperature peaks and the degree of variability would be slightly affected. In the Muskrat Falls reservoir temperatures would be 1.0 to 3.5 degrees Celsius cooler from May to August, and 1.2 to 2.6 degrees warmer in September and October. Predictions for the Gull Island reservoir were similar. In an average year, the cool down and warm up periods in both reservoirs were expected to occur about two weeks later than present. Nalcor stated that these minor changes in temperature would not affect fish growth and maturation but might cause a subtle shift in the spawning periods for some fish species. However, any such changes would fall within the range of observed longer-term variability. Implications for ice formation are addressed in Chapter 8. In response to participant concerns regarding its failure to address climate change effects, Nalcor noted that climate change issues had been incorporated into their predictive temperature models and that the provincial Water Resource Management Division stated that it would review and approve any Lower Churchill Project-related climate change adaptation procedures.

Productivity

Nalcor indicated that turbidity in the water column could reduce plankton levels in the reservoirs immediately after impoundment by 50-75 percent, with levels returning to baseline within twenty years in the Muskrat Falls reservoir and within five years for the Gull Island reservoir. However, during the same period, higher levels of nutrients would be available to aquatic plants (including plankton), increasing their growth and hence increasing the production of other aquatic feeders at all levels of the food chain. Nalcor suggested that the two trends could potentially cancel each other out to a certain extent.

Since the Muskrat Falls reservoir was expected to have a shorter retention time of about 10 days, compared to the 28 days in the Gull Island reservoir, the amount of planktonic food for fish would be less in the Muskrat Falls reservoir due to its more rapid turnover of water. As water would be retained longer in the Gull Island reservoir, there would be more time for a plankton community to develop, thus providing an enhanced food source for plankton-eating fish.

Mitigation and Monitoring

To partially mitigate the increase in suspended solids, Nalcor committed to employ erosion stabilization and sedimentation control practices where necessary and to maintain a 15-metre buffer around existing watercourses during reservoir preparation. These buffers would also help to prevent water temperatures rising during warm weather. Nalcor concluded that other possible mitigation options, such as flocculants and berms around eroding shorelines, would not be economically feasible due to the Project's scale. Nalcor did not agree with Fisheries and Oceans Canada's request to collect additional baseline information on fish spawning sites prior to inundation because it felt its Compensation Plan already adequately addressed spawning habitat enhancement and creation.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to water quality included the following:

- respond to any accidents and spills involving small craft;
- collect water samples at locations affected by construction activity and in the reservoirs during operations and continue its participation in the Provincial Real Time Water Quality Monitoring Program;
- employ erosion stabilization and sedimentation control practices where necessary and maintain a 15-metre buffer around existing watercourses during reservoir preparation;
- collect data on plankton, fecundity, food organisms, and fish species found in Lake Winokapau's extreme depths, and carry out additional baseline data collection on physical and biological characteristics of the reservoirs for a minimum of five years prior to inundation;
- monitor bank erosion within the Gull Island and Muskrat Falls reservoirs using remote sensing, direct measurements and real time weather and wave measurements; and
- re-run models for shoreline stability, sediment transport and nutrient loading through aquatic profiling and direct measurement.

6.2.2 Participants' Views

Fisheries and Oceans Canada questioned whether water quality would return to baseline within Nalcor's predicted 20-year timeframe. It recommended that Nalcor collect more baseline data on the water quality and biological characteristics of the river prior to reservoir inundation in order to strengthen existing data and to reinforce its original predictions.

NunatuKavut raised concerns about elevated suspended solids and the downstream effects of reduced sediment transport. Fisheries and Oceans Canada, The Natural History Society and others agreed with Nalcor that suspended solid increases in the Muskrat Falls reservoir could affect aquatic plant production by decreasing light penetration and removing nutrients through sedimentation and could cause negative effects on existing and proposed fish spawning beds and rearing shallows for young fish. Fisheries and Oceans Canada recommended that Nalcor collect additional baseline information on spawning sites throughout the lower Churchill River prior to inundation, and develop a map of confirmed and potential spawning areas. It also asked Nalcor to ensure that areas to be flooded were pre-conditioned as much as possible. Fisheries and Oceans Canada also had concerns that even minor changes in water temperature could have significant effects on spawning and growth of fish, and recommended that Nalcor collect additional baseline data on the temperature patterns of the river prior to project construction.

The Natural History Society commented that the decrease in average water temperatures of one to four degrees Celsius from May to September would coincide with the main growing season for fish, and therefore could affect fish growth. Other participants voiced concerns that climate change effects were not properly assessed.

Fisheries and Oceans Canada was uncertain whether Nalcor's predicted trophic surge after reservoir filling would actually occur and that it would be difficult to predict its size or overall effect. It therefore recommended Nalcor collect more baseline biological data and identify specific food organisms included in the diet of the relevant fish species prior to reservoir inundation. Additionally, given that certain fish species found in the Lower Churchill have been reported elsewhere to occur in very deep water, it also recommended that this sampling include the extreme depths of Lake Winokapau.

Fisheries and Oceans Canada agreed with Nalcor that there were limited options to mitigate suspended solids and nutrient levels in such a large system, and the application of flocculants or flushing to manage solids could prove difficult and contentious. Rather than the 15-metre buffer zone planned by Nalcor during construction, it recommended a 20-metre zone. The downstream effects of water quality below Muskrat Falls are discussed in Section 6.7.

6.2.3 Panel Conclusions and Recommendations

The Panel concludes that, because of the extent of the change resulting from creation of the two reservoirs and the length of time that water quality would be affected; there is uncertainty about how the ecosystem would respond during the transitional period and how long stabilization would take. This is compounded by the fact that Nalcor has been unable to identify viable adaptive measures to address excessive turbidity or nutrients, with the exception of possibly stabilizing sections of eroding shoreline which the Panel believes would have limited application.

If the Project were to proceed, Nalcor should implement all possible mitigation measures to reduce erosion and sedimentation during the construction and reservoir clearing phase. These would include the use of best practices to control erosion and sedimentation at construction sites and the maintenance of a general 15-metre vegetated buffer along the margins of all watercourses in the inundation area. While Fisheries and Oceans Canada called for the use of a 20-metre buffer, the Panel recognizes that the wider the buffer, the more trees that will be ultimately left unharvested (see Chapter 4).

The Panel was not convinced by the argument that, because the river already experiences pulses of high turbidity, consistently high levels of total suspended solids over many years in the Muskrat Falls reservoir, well over the Canadian Council of Ministers of the Environment guidelines, would not have an adverse effect on the aquatic ecosystem. The Panel acknowledges that this would likely be a lesser problem in the Gull Island reservoir.

The Panel understands that the provincial Real Time Water Quality Monitoring program would provide rapid feedback in the case of a sudden spike of suspended solids during the construction phase, and Nalcor should be prepared to take rapid action to address problems.

RECOMMENDATION 6.3 Erosion and sedimentation prevention

The Panel recommends that, if the Project is approved, Nalcor be required to prepare an erosion and sedimentation prevention strategy including the use of 15-metre vegetated buffer areas during reservoir preparation, best practices at all construction and cleared areas, and specified adaptive management measures to be applied should these mitigation measures fail.

The Panel addresses the significance of potential water quality changes during the transition period in the context of fish habitat changes including the proposed compensation strategy, and the resulting effects predicted for fish assemblage in Section 6.6.

6.3 ENTRAINMENT EFFECTS ON FISH

6.3.1 Nalcor's Views

Nalcor stated that negative effects on fish from the proposed facilities could occur as they are carried through turbines or over the spillways where they might be killed or damaged by direct injury, gas bubble disease, or predation above and below the facilities.

Kaplan-type turbines that would be used at the Muskrat Falls facility typically have lower mortality and injury rates than other models. Nalcor predicted a mortality rate of six to 14 percent and injury rates of two to 22 percent with the larger fish being at higher risk. Since Muskrat Falls currently presents a complete barrier to upstream migration of fish, Nalcor concluded that a population-based migration would not occur in this vicinity.

Francis-type turbines were planned for the Gull Island facility. These models were expected to have higher mortality and injury rates at 32 to 34 percent and three to 34 percent respectively. However, Nalcor's sampling indicated fish movements, mainly of white sucker and brook trout, in the vicinity of the proposed Gull Island facility were limited and localized.

Nalcor committed to manage water flows under the Water Management Agreement to minimize use of spillways and to use adaptive management techniques to deter fish from approaching intakes. It would also seek an authorization under Section 35(2) of the *Fisheries Act* from Fisheries and Oceans Canada for fish mortalities related to entrainment and impoundment. Nalcor also committed to collecting data on entrainment during operations at each facility to determine the actual injury and mortality rates under normal operating conditions.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to entrainment included the following:

- request an authorization under Section 35(2) from Fisheries and Oceans Canada for fish mortalities related to entrainment and impoundment;
- minimize fish entrainment by design considerations for turbines and spillways, including using 'fish friendly' Kaplan turbines at Muskrat Falls;
- manage water flows under the Water Management Agreement to minimize use of spillways;
- use adaptive management techniques to deter fish from approaching the intakes; and
- collect data on entrainment during operations at each facility to determine actual injury and mortality rates under normal operating conditions.

6.3.2 Participants' Views

Fisheries and Oceans Canada agreed with Nalcor's assessment of the potential injury and mortality rates relating to fish entrained through the turbines, but was uncertain about the number of fish that might go through the turbines and therefore the potential effects at the population level. Mitigation for entrainment might be possible but would be species-specific and therefore could not be determined until monitoring results showed which species were being entrained. At each facility, Nalcor should monitor fish injury and mortality rates under normal operating conditions to assess related population level effects properly.

The Natural History Society and Sierra Club Atlantic voiced concern about fish losses stating that turbines could kill up to 60 percent of the fish going through, that those that survive might be damaged or stressed, and that, on the west coast of Canada, authorities are in the process of removing dams to restore the wild stocks. It also suggested that adding a fishway at Muskrat Falls, currently a barrier to fish migration, could help to compensate for entrainment damage to migratory fish.

6.3.3 Panel Conclusions and Recommendations

The Panel concludes that because there is no evidence of migratory fish movements in the areas of either proposed dam, entrainment losses by themselves are not likely to pose a risk to fish at the population level. However, entrainment losses would continue throughout the life of the Project, and the combined mortality and injury rate associated with the Francis-type turbine to be used at Gull Island is relatively high.

The Panel also notes that turbine-related fish damage contributes to bioaccumulation of methylmercury and to the transfer of methylmercury effects downstream.

Evidence was not provided as to whether the changed environment, from river to reservoir, in the vicinity of the dams would be likely to affect random fish movements in the area and therefore of potential entrainment.

While adaptive management measures were mentioned, the feasibility of these measures was not discussed.

The Panel acknowledges that entrainment losses are not likely to be a serious concern at Muskrat Falls but risks would be higher at Gull Island. Given the depth of the turbine intake species that could be entrained would likely include lake trout, adult brook trout, whitefish and suckers.

The Panel concludes that Nalcor should carry out additional sampling before the Gull Island dam is commissioned to verify the low numbers of both adult and juvenile fish movement in this vicinity and develop a detailed adaptive management strategy to be approved by Fisheries and Oceans Canada before an authorization under Section 35(2) is given.

RECOMMENDATION 6.4 Mitigating entrainment effects

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to take the following steps before receiving a Section 35(2) authorization with respect to potential entrainment losses: (a) carry out further baseline sampling at Gull Island to verify both juvenile and adult fish movements in this area; and (b) prepare a mitigation and adaptive management strategy that establishes thresholds for further action, and identifies what adaptive measures would be taken when, and for what species. The strategy should also address compensation measures should it become apparent that high losses of a specific species are inevitable.

6.4 FATE OF MERCURY IN THE RESERVOIRS

6.4.1 Nalcor's Views

Nalcor described how reservoir formation leads to the release of methylmercury into the aquatic environment. When soils in reservoir areas are flooded, bacterial breakdown of the vegetation causes methylation, a chemical process that converts inorganic mercury in the soils to methylmercury, a more toxic form. Methylmercury then enters the aquatic ecosystem accumulating in aquatic animals mostly when they feed on organisms with elevated mercury. The concentration of methylmercury increases upward through the food chain (referred to as bioaccumulation) resulting in higher concentrations in predatory fish, in animals such as otters or seals that eat fish, and potentially in humans. Typically, as shown in experience from other reservoirs in boreal regions, mercury levels in fish peak five to 16 years after flooding and then

gradually decrease to background levels over 30 or more years. The effects of mercury on wildlife are addressed in Chapter 7 and on humans in Chapter 13.

Nalcor also described how creation of the Smallwood Reservoir during the Churchill Falls project in the 1970s caused methylmercury concentrations to increase in the Churchill River watershed. No baseline data were available for mercury levels in the Churchill River before the Churchill Falls project, and fish sampling only occurred once in the first 15 years that Churchill Falls was operational which meant that peak concentrations might have been missed. However data collected in 1998 and 2006 indicated that levels of mercury in water, sediments and zooplankton were approaching or within the background range found in undisturbed lakes in the region. Nalcor also reported that mercury levels in non-fish eating fish species within the Churchill River watershed were approaching or had returned to background conditions, while levels in northern pike and lake trout (fish-eating species) remained elevated. A consumption advisory is in effect for these species.

Nalcor initially used a combination of screening level regression models and assessment of trends to predict peak Project mercury levels. It later refined these initial values with field data collected in 2010 as well as incorporating more of the raw data obtained from previous studies. These results predicted that fish mercury concentrations in adult sized fish would increase between 230 and 480 percent. Regression modelling predicted increases for adult northern pike ranging from 190 percent over existing levels in the Muskrat Falls reservoir without Gull Island, increasing to 230 percent if both reservoirs were constructed within five years of each other. Given the level of accuracy of the method, Nalcor decided to conservatively use the higher value (230 percent) for all fish species in the Muskrat Falls and Gull Island reservoirs. In the case of smaller fish (300 mm minimum size), peak mercury concentrations were calculated to be 340-480 percent over baseline values. For some species, therefore, concentrations would be higher in juveniles than in adults, reflecting a trend observed in other reservoir studies.

Nalcor stated that, compared to increases seen in reservoirs in Quebec and Manitoba, the predicted increases in adult fish in the lower Churchill River would be in the low to moderate range, in part because of the short residence times of the water in the reservoirs. Lake whitefish would normally be at the lower end of the range, while fish-eating species such as northern pike that are still affected by mercury from the Churchill Falls project would show moderate increases. Lake whitefish, longnose suckers and white sucker, while not normally fish-eating species, might switch their diet to take advantage of dead or injured fish coming through the turbines. As a result, these species could have considerably higher levels of mercury downstream from the tailrace than in the reservoir itself.

After applying the calculated peak increase factors to all fish species in the lower Churchill River, and comparing them to levels described in the literature, Nalcor stated that the predicted mercury body burden levels would likely not have an effect on fish health either within the reservoirs or downstream.

Nalcor's models reflected other studies in that mercury concentrations would peak within five to 15 years after flooding, declining to baseline levels within 35 years. The modelling showed that peak fish mercury levels would be similar whether the construction periods for the two reservoirs overlapped or not. However, if construction of the Gull Island facility were to be delayed, this would extend the period of time during which fish mercury levels would be elevated.

With respect to cumulative effects from the Churchill Falls project, Nalcor indicated that the remaining mercury effects were adequately captured through baseline sampling and mercury

mobilized in the Smallwood Reservoir would not contribute significantly to fish mercury levels in the lower Churchill River in the future.

Nalcor stated that mobilization of methylmercury in the reservoirs is an unavoidable impact of hydroelectric projects and changing to the "full clearing" option (see Chapter 4) would only reduce mercury levels in fish by about ten percent which would not justify the extra expense. It also indicated that other types of mitigation, such as intensive fishing of certain species, were unproven and likely not feasible. Nalcor also noted that Natural Resources Canada's recommended large scale removal of vegetation and soils before inundation had only been tried at an experimental level, would not be technically or economically feasible, and would have considerable environmental effects.

Nalcor committed to monitor fish mercury concentrations annually for the first ten years following inundation to verify predictions. Monitoring frequency could then be adjusted, depending on results. The potential application of consumption advisories is addressed in Chapter 13.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation and monitoring related to methylmercury included the following:

- monitor fish mercury concentrations annually for the first ten years following inundation to verify predictions.

6.4.2 Participants' Views

Both Environment Canada and Natural Resources Canada concluded that Nalcor had modelled mercury increases in the lower Churchill River appropriately. Fisheries and Oceans Canada also stated that Nalcor's predictions about mercury levels were consistent with the current state of knowledge but questioned the accuracy of Nalcor's predictions regarding the magnitude and duration of methylmercury in the lower Churchill River. It therefore recommended that Nalcor develop a comprehensive program to monitor spatial and temporal changes in mercury in fish within the reservoirs and downstream including at Goose Bay following reservoir creation. The frequency and timing of sampling should support a clear assessment of the magnitude and timing of these changes, and inform determinations of risks to human health and implementation of related fisheries management measures. More baseline data should be collected on mercury levels in estuarine fish downstream of Muskrat Falls and in Goose Bay in advance of inundation.

Sierra Club Atlantic questioned how high methylmercury levels would reach in fish following impoundment, given that the levels in the Churchill River were currently above normal background, and questioned whether these levels would actually return to baseline after 35 years, as predicted by Nalcor. Fisheries and Oceans Canada commented that background levels for mercury in older, larger piscivorous fish in Labrador sometimes exceeded recommended guidelines for consumption even in pristine lakes. Therefore elevated levels of mercury in pike and lake trout in the lower Churchill River would not be unexpected and information suggested that only a few of the older, much larger fish still show elevated levels.

Natural Resources Canada pointed out that development of knowledge about the methylmercury problem associated with reservoir creation is still at an early stage, and to date mitigation has been largely confined to consumption advisories (addressed in Chapter 13). Recent research has shown that the most effective mitigation may be removal of vegetation and the upper soil layer in what would become the drawdown area of the new reservoir. It therefore

recommended that Nalcor consider large-scale removal of mercury and carbon-rich soils within this area, the so-called "bathtub ring", to mitigate methylmercury production, acknowledging that this form of mitigation had so far only been conducted at a smaller experimental scale.

6.4.3 Panel Conclusions and Recommendations

The Panel notes that Natural Resources Canada challenged the notion that mercury mobilization is an inevitable consequence of hydro power development and consumption advisories are adequate as the only response. The benefits of carrying out pre-inundation mitigation such as more extensive clearing of vegetation or soils would need to be evaluated in the context of effects of the predicted mercury levels on fish-eating wildlife (Chapter 7), the use of renewable resources (Chapter 8) and human health (Chapter 13). Similarly, the significance of the cumulative effect of another period of methylmercury contamination on the lower Churchill system, following the effects of the Churchill Falls project, should be evaluated in the context of human health and the use of renewable resources.

The Panel recognizes that there appears to be no clear evidence that predicted levels of mercury would adversely affect fish health but questions how much research has been carried out on the effects of mercury on fish health in conjunction with other stresses imposed by reservoir creation projects, and also why Nalcor initially confined its measure of fish health to mercury effects.

The Panel accepts that selective soil removal around the reservoir rim is not yet proven as mitigation but observes that this approach appears to have merit, especially if the clearing can be confined to the reservoir rim. The Panel also notes that the type of preparation required for this mitigation might be complementary with the riparian and fish habitat measures that Nalcor would already be undertaking.

The Panel concludes that consumption advisories transfer part of the cost of generating hydroelectricity to local populations and it is therefore important to find better approaches to reducing methylmercury in reservoirs. Therefore the Panel believes that Natural Resources Canada should move ahead with testing the mitigative approach of removing soil in the drawdown zone, including determining how to avoid or minimize environmental impacts, and ways to make beneficial use of the materials removed.

RECOMMENDATION 6.5 Pilot study for methylmercury mitigation through soil removal

The Panel recommends that Natural Resources Canada, in consultation with Nalcor and, if possible, other hydroelectricity developers in Canada, carry out a pilot study to determine (a) the technical, economic and environmental feasibility of mitigating the production of methylmercury in reservoirs by removing vegetation and soils in the drawdown zone, and (b) the effectiveness of this mitigation measure. The pilot study should take place in a location where the relevant parameters can be effectively controlled (i.e. not in the Lower Churchill watershed) and every effort should be made to complete the pilot before sanction decisions are made for Gull Island. If the results of the pilot study are positive, Nalcor should undertake to employ this mitigation measure in Gull Island to the extent possible and monitor the results.

6.5 FISH HABITAT LOSS, ALTERATION AND COMPENSATION

6.5.1 Nalcor's Views

Nalcor was unable to quantify the fish population in the lower Churchill River but described the total standing stock as low because of limited nutrient inputs and severe winter conditions. Nalcor characterized many of the species found in the river as being at the extreme northern distribution of their range with respect to water velocity and temperature and that typical life history information described in the literature for these species might not always be applicable.

Nalcor stated that the key policy guiding its assessment of effects on fish and fish habitat was Fisheries and Oceans Canada's "No Net Loss" principle for the management of fish habitat. Given the scale of the Project, Nalcor, in collaboration with Fisheries and Oceans Canada, developed a methodology specific to the lower Churchill River to calculate current and future habitat uses for all of the fish species present in the assessment area. These 'Habitat Utilization Indexes', characterizing habitat use by species and life stage, were developed using fish capture data supplemented by literature with additional input from aquatics experts where necessary.

Nalcor indicated that while some post-inundation habitats would have similar water velocity ranges and substrate compositions to existing habitat types, increased water depths of the reservoirs would change habitat suitability for various species. Future habitat types were therefore further delineated within the proposed reservoirs using water depth to more specifically characterize those deeper water habitat types differing from the existing habitat. Nalcor generally felt that these 'Habitat Utilization' values were quite conservative based on the fact that Fisheries and Oceans Canada would not agree to allow new, deeper habitat resulting incidentally from reservoir creation to be quantified as offsetting some of the habitat loss even though fish would definitely use these areas. These values could also identify some specific life-cycle stages within a given species that might require additional habitat to be enhanced or created within each reservoir.

Table 3, drawn from the EIS, shows the amount of fish habitat that would potentially be destroyed or altered by the Project as determined by Fisheries and Oceans Canada. In addition, the direct footprint of the Gull Island and Muskrat Falls generating facilities would destroy 26.03 and 7.30 hectares, respectively.

Table 3. Estimated habitat quantities (in hectares) altered by the Project (Source: Nalcor)

Habitat Type	Gull Island (ha)	Muskrat Falls (ha)
Riverine fast velocity habitat - Churchill River main stem	2,821.85	727.80
Riverine intermediate velocity habitat - Churchill River main stem	1,264.06	-
Riverine intermediate velocity habitat - Churchill River tributaries	25.05	5.02
Riverine fast velocity habitat within the Churchill River tributaries	16.62	3.35
Riverine habitat within streams of the Churchill River	14.28	11.57
Lacustrine littoral habitat within the Churchill River main stem	212.98	-
Total	4354.84	747.74

Nalcor stated that this loss would be offset by creation of new habitat both by incidental means (reservoir creation) and through the construction of physical compensation works. Impoundment of the reservoirs would increase the wetted area approximately four-fold at Muskrat Falls and close to two-fold at Gull Island. Nalcor predicted a net overall increase in fish habitat of 11,865 hectares as a result of reservoir creation (3,652 hectares in the Muskrat Falls Reservoir and 8,213 hectares in the Gull Island Reservoir). The main change in available habitat would include a reduction in fast and intermediate velocity habitat and an increase in slow flowing habitat.

In order to prepare its Fish Habitat Compensation Strategy, Nalcor presented compensation options and its adaptive management approach to the public at three technical workshops and a number of individual meetings. Nalcor focused its compensation and enhancement activities on susceptible and socially valued fish species and life-cycle stages and those having the highest requirement for specific habitat features to be modified or constructed. Table 4 shows the main type and location of the proposed compensation works:

Table 4. Proposed fish habitat compensation works (Source: Nalcor)

Type of Habitat Compensation	Method	Muskrat Falls	Gull Island
Nearshore habitat	Remove vegetation and terrace shoreline 0.5 metres above low supply level; re-vegetate disturbed riparian areas	Up to 25 km of littoral habitat	Up to 150 km of littoral habitat
Delta habitats	Create or enhance delta areas through grading	Up to 74 ha	Up to 390 ha
Spawning sites	Create or enhance spawning shoals	1,065 ha at inflow and outflow of Gull Lake	73 ha at the new Gull Island Plateau and other upstream works

In addition, Nalcor proposed to re-seed and re-establish aquatic vegetation at tributaries and upstream of Lake Winokapau and enhance natural habitat through its proposed delta habitat and shoreline rehabilitation works, and also to create artificial pike habitat by leaving areas of unharvested wood or other forms of artificial spawning material.

Nalcor also committed to prepare and implement its compensation plans for the two reservoirs separately and independently. For example, habitat lost in the section of river between Gull Island and Muskrat Falls would be replaced in the Muskrat Falls reservoir.

Nalcor acknowledged that it would likely be difficult to modify habitat compensation works after flooding if monitoring showed that they were ineffective. This might require providing compensation at sites outside the Project footprint and guided by Fisheries and Oceans Canada's fish habitat compensation hierarchy policy. The policy stated that compensation works are to be located in the same watershed and for the same species as those to be lost before exploring other options in other watersheds or for other species. Decisions about habitat compensation would include consideration of community objectives. In addition to the compensation planned in the lower Churchill River, Nalcor committed to investigate the rehabilitation of Grand Lake as part of its overall fish compensation strategy in response to concerns about saltwater intrusion into Grand Lake that occurred from river diversions associated with the Churchill Falls project.

Nalcor concluded that its compensation and mitigation strategies would go a long way toward achieving Fisheries and Oceans Canada's No Net Loss policy objective and would provide sufficient habitat for each life cycle of every fish species found in the Project area, and therefore, no significant adverse effects for fish and fish habitat were expected during Project construction or operation.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to fish habitat compensation included the following:

- prepare separate fish habitat compensation plans for the Muskrat Falls and Gull Island reservoirs, implement any new compensation works, and enhance any existing habitat described in the plans including applying adaptive management where required;
- investigate the salinity of water in Grand Lake and incorporate plans to remedy this issue as part of the fish compensation program;
- consider habitat enhancement sites outside the flood zone to compensate for potentially ineffective physical compensation works after impoundment;
- carry out long-term monitoring and adaptive management of compensation works to ensure no net loss in the productive capacity of fish habitat;
- collect a minimum of five years of additional baseline data on physical and biological characteristics prior to inundation of the Muskrat Falls and Gull Island reservoirs; and
- continue monitoring the deep water habitat in Lake Winokapau prior to impoundment.

6.5.2 Participants' Views

Fisheries and Oceans Canada generally concurred with Nalcor's description of long-term effects the Project would have on fish habitat and indicated that Nalcor's compensation strategy was acceptable in principle with details to be provided in its forthcoming compensation plan. Fisheries and Oceans Canada noted that Nalcor had made significant long-term commitments to comprehensive habitat monitoring in the reservoirs and expected this monitoring to adequately confirm predictions of fish habitat utilization. It did however identify uncertainties about how long it would take for water quality in the reservoirs to stabilize and how fish populations would adapt to these changes. To address these concerns it recommended the collection of more pre-inundation baseline data on fish and fish habitat in advance of construction.

Participants were concerned that Nalcor's predicted changes to fish habitat showed up to and above 90 percent loss in available habitat after inundation for a number of species (e.g. pike, burbot, ouananiche, sucker, stickleback) residing in Muskrat Falls reservoir. Grand RiverKeeper Labrador Inc. used pike as an example of a species that would experience a major reduction in juvenile habitat from 6349 hectares to only 3 hectares after impoundment. It also expressed concern that Nalcor's Habitat Utilization Indexes were based on estimating overall habitat area and did not take into account the complex relationships between species.

The Natural History Society disagreed with Nalcor's conclusion that there would be a net gain of fish habitat and the environmental effect of the project on the aquatic environment was not considered significant. For instance, it pointed out that only 18 percent of suitable tributary fish habitat from the original total habitat would remain at the Muskrat Falls Reservoir after inundation. Grand RiverKeeper Labrador Inc. added that it would also be difficult to re-create those important complex small-scale stream habitats present in the lower Churchill River.

Participants raised a number of concerns about new habitats including the following:

- the proposed delta habitat enhancement at Edward's Brook and Elizabeth River could be affected by mass slumping, common in both areas;
- in spawning areas proposed at some of the confluences (e.g. Minipi River), predators such as pike could decimate stocks by preying heavily on fry and juveniles;
- the proposed Gull Island plateau spawning area would not be effective as a spawning and rearing habitat due to predation, dewatering, changes in gravel flow, and entrainment of fry downstream, and
- bank instability and other sources of siltation could threaten newly created habitat and Fisheries and Oceans Canada felt there was insufficient soil and sediment data from the reservoirs to predict bank stability.

Innu Nation, the Nunatsiavut Government, Grand RiverKeeper Labrador Inc. and others, expressed the view that fish species would be heavily dependent on compensation measures for survival. Referencing several reports, Grand RiverKeeper Labrador Inc. criticized the success of compensation works in mitigating habitat loss caused by large projects and suggested that neither Fisheries and Oceans Canada nor Environment Canada had adequately fulfilled their obligations regarding monitoring and enforcement with respect to other large scale compensation initiatives under the *Fisheries Act*. Innu Nation and other participants also suggested that Nalcor should investigate alternate compensation options outside the Project area given that the fish in the reservoirs would still be contaminated by mercury for a long time.

6.5.3 Panel Conclusions and Recommendations

The Panel notes that new compensation works would only be able to create slow velocity habitat and there would be a net loss of tributary habitat since replacement habitat would have to be created in the main stem, thus reducing overall biodiversity. This would favour certain fish species over those preferring fast velocity habitats.

If there is a considerable delay before the Gull Island reservoir is created, this would lessen the risk that a given species in the Muskrat Falls reservoir would be permanently affected by the combined effects of habitat loss and water quality changes during the transition period because fish would be available upstream to repopulate stabilized downstream habitats. However there is also a risk that initial elevated suspended solid levels during impoundment after the Gull Island facility construction could silt compensation habitats in the downstream Muskrat Falls reservoir.

The Panel recognizes that the creation of the Muskrat Falls reservoir first, with the potential for a number of years gap before the Gull Island facility is built, would lower the environmental risk from Project effects somewhat by allowing Nalcor to "test" its proposed compensation strategy on a relatively modest scale.

The Panel acknowledges that if Nalcor's proposed compensation strategy were successful, it would eventually likely address most of the habitat needs of resident species. The Panel recognizes that Fisheries and Oceans Canada has tentatively endorsed the strategy and has reported success with smaller compensation works in the region, including those carried out by Nalcor. However, detailed evidence was not provided about the context or areal extent of these smaller projects (for example, whether extended periods of high levels of suspended solids were involved). Nor did Nalcor present evidence of successes or lessons learned from similar large-scale hydroelectric projects.

Because of the loss of high percentages of habitat for certain life stages of certain species (and in the case of pike high percentages of almost all of the life stages), particularly in the Muskrat Falls reservoir, there would be very little room for error when designing and applying compensation works. Therefore the Panel observes that much depends on the success of the compensation strategy.

The Panel heard evidence that Fisheries and Oceans Canada has not been able to demonstrate substantive progress in achieving its mandate of no net habitat loss and that fish habitat compensation projects across the country, when examined closely, often do not reproduce successful or equivalent habitat to that which was lost. Regional staff from Fisheries and Oceans Canada stated that their experience in Newfoundland and Labrador was different and that compensation projects in the province have been effective but did not present detailed information to support these statements.

RECOMMENDATION 6.6 Fish habitat compensation

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to:

- prepare a detailed fish habitat compensation plan in consultation with stakeholders and Aboriginal groups that addresses to the extent possible the likely interactions between species and life stages, including predator-prey relationships and also the potential to replace tributary-type habitats;
- prepare a habitat monitoring plan including thresholds for further action and identified adaptive management measures;
- implement the proposed plan, documenting the process;
- evaluate the extent to which new, stable habitat has been created, its use and productivity; and
- apply any lessons learned from implementing the Muskrat Falls compensation plan to the proposed Gull Island compensation works.

If, after all feasible adaptive management measures have been applied, Fisheries and Oceans Canada determines that there has been a significant shortfall in the amount of habitat successfully created and maintained, compared to the original proposal, Nalcor should be required to compensate by carrying out habitat compensation works in other watersheds in Labrador. Preference should be given to remediation and enhancement in areas adversely affected by the Churchill Falls project.

While recognizing the comprehensive nature of Nalcor's compensation plan, the Panel concludes that there is considerable risk that compensation measures would not be as effective as needed for the following reasons:

- the Project would create a heavy dependency on the success of an ambitious habitat compensation plan;
- there are considerable uncertainties associated with Nalcor's ability to establish new, stabilized habitats in an environment that would be fundamentally unstable due to ongoing erosion for at least 15 years;
- new, low velocity, engineered habitats in the main stem would not easily provide the variety of niche habitats that have developed over long periods of time in the existing river and tributaries;
- habitat replacement plans did not take into consideration the complex interactions of species and this could lead to unintended and deleterious effects, and

- adaptive management, should monitoring show that the new habitat was not working effectively, might not be possible.

The Panel makes its significance determination in the following section dealing with effects on fish assemblage.

6.6 PREDICTED FISH ASSEMBLAGE IN THE RESERVOIRS

6.6.1 Nalcor's Views

In response to the Panel's request during the hearing, Nalcor provided a more specific description of how the combined effects of reservoir filling and operation, water quality changes and habitat alteration and replacement would affect the fish assemblage both during the transitional stage and after the reservoirs had stabilized. The downstream fish assemblage is discussed in Section 6.7. Nalcor predicted that the fish biomass in the newly created reservoirs would initially decline due to a 'dilution' effect from impoundment creating a much larger water body before existing fish had the opportunity to respond by increasing their production to reflect the newly available habitat. Then overall fish population numbers would first increase 3-5 years after impoundment or longer due to a predicted trophic surge, and then decline to a more stable level as the physical and chemical water conditions, as well as biological communities stabilized. Nalcor predicted that most of the fish species would prefer the slower water velocities in the reservoirs as current habitat use in the faster velocities of the river is not typical of values found in the literature.

The Muskrat Falls impoundment process was expected to result in only a minor increase in food available for fish but this could still translate into a modest increase in fish production. However, Nalcor was not certain how this would affect the fish assemblage. Species such as brook trout and ouananiche could change their diets to eat more zooplankton, and species such as lake whitefish and lake chub would also be able to take advantage of increased phytoplankton and zooplankton. After the completion of the Gull Island reservoir, whitefish and sucker species downstream from the Gull Island tailrace might also feed on fish killed or injured through entrainment.

Prior to habitats becoming stable at Muskrat Falls after inundation, there could be potential issues related to suspended solids and stabilization of the nearshore slow flowing habitat as it reaches a stable equilibrium. Nalcor's studies showed the potential for shoreline erosion within the Muskrat Falls reservoir, particularly during the first 10-15 years. During this stabilization period, suspended solids were expected to increase. Nalcor predicted that brook trout, ouananiche, round whitefish, northern pike, and white sucker might decrease in numbers due to the temporary reduction in spawning and early rearing habitat, especially nearshore from this increase in solids. Nalcor took these effects into account when designing habitat compensation works for the Muskrat reservoir. In responding to participant concerns of a potential pike-sucker dominated community Nalcor also noted that other reservoirs had seen a boom in large predators, particularly pike, because of the trophic surge in this transitional period, but in the long term it did not expect dominant species to change in the fish assemblage.

In the larger Gull Island reservoir, Nalcor predicted a greater increase than at Muskrat Falls in production of phytoplankton and zooplankton due to the slower flushing rate and longer retention time. Lake whitefish and lake chub both eat planktonic food in this section of river and would likely take advantage of the projected increase. As in the Muskrat Falls reservoir, brook trout and ouananiche might also shift their feeding to consume more zooplankton in the Gull Island reservoir. In addition, species such as longnose sucker, white sucker, round whitefish,

longnose dace, ouananiche, brook trout, and lake trout could take advantage of the projected increased production of bottom dwelling (benthic) invertebrates.

Within the Gull Island reservoir, habitat quality would be reduced after impoundment for certain life-cycle stages of fish such as ouananiche and some prey species. Because water levels would fluctuate more in the Gull Island reservoir (3.0 metres compared to only 0.5 metres in the Muskrat Falls reservoir), Nalcor also predicted that those species that rely upon nearshore habitats for fall spawning and incubation in spring may be affected by some loss of recruitment. Lake whitefish, white sucker, northern pike and brook trout might currently be using delta habitat where tributaries enter the main stem of the river for spawning and young-of-year rearing. Nalcor said it would address any reduced habitat function for certain life-cycle stages after impoundment through physical compensation works.

Nalcor concluded that no significant changes to habitat suitability would occur and as a result, the final fish assemblage at Muskrat Falls and Gull Island was not predicted to change, no species would be lost through the transition period to the final stabilized population, and the relative abundance within the existing assemblage would be more or less the same.

Nalcor committed to collecting additional baseline data on fish health and habitat utilization, as reflected in its 2010 field program, for a minimum of five years prior to inundation to strengthen predictions of incidental gains in habitat. This would serve to improve evaluation of functioning of fish habitats after impoundment and better allow mitigation of loss of productive fish habitat. As new relevant baseline information becomes available, Nalcor committed to update the predictions regarding the amount of habitat available after reservoir creation, and adjust the compensation strategy and plan accordingly. Nalcor also committed to conduct a review of data from other sites with similar species assemblages to investigate the effects of fragmentation of river systems from dam construction on movement and migration of all life stages of fish species and associated population levels.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to fish assemblage included the following:

- implement mitigation compensation and adaptive management as described in Section 6.5;
- collect additional baseline data on fish health and habitat utilization, as reflected in the 2010 field program, for a minimum of five years prior to inundation; and
- review data from other sites with similar species assemblages to investigate the effects of fragmentation of river systems from dam construction on movement and migration of all life stages of fish species and associated population levels.

6.6.2 Participants' Views

Participants voiced concerns regarding the uncertainty surrounding potential changes to fish habitat quality during a multi-year transitional period between impoundment and reservoir stabilization. Fisheries and Oceans Canada noted inherent uncertainties in estimating how long it would take the incidental habitat created in the new reservoirs to become productive, the ability of fish to adapt from a fast velocity environment to lake-type habitats over the extended transitional period, and the availability of spawning habitat in the tributaries and streams that would flow into the proposed reservoirs. It noted that the Muskrat Falls population was more likely to experience changes to the fish assemblage than at Gull Island and listed ouananiche, burbot and pike as species it felt would be most at risk from potential habitat loss and

transitional change. It therefore recommended that Nalcor collect additional baseline data on fish and fish habitat prior to impoundment to refine knowledge of existing habitat availability in the areas to be flooded.

Participants also questioned how the combination of water level changes, inundation of nearshore habitats, restricted downstream flows and availability of the constructed compensation works would change the existing fish biodiversity and ecosystem. They also voiced concern regarding the effects of the projected extended multi-year transition period in the form of altered water quality and stabilization of new habitats on fish species.

The Natural History Society stated that the quality of fish habitat might be reduced despite an increase in overall available habitat area at Muskrat Falls reservoir. It felt that, although the newly developed shallows of the reservoir would provide suitable habitat for lake trout spawning, a thermocline would not develop and as a result there would not be sufficient habitat diversity for lake trout to thrive in competition with northern pike. Brook trout, white fish, lake trout and burbot spawn in the fall or early winter in water depths of less than a metre so that a drawdown in the spring would have a negative effect on these species. Aquatic vegetation, essential for pike spawning, might also be considerably reduced both by drawdowns and loss of shallow, muddy and silty areas.

Grand RiverKeeper Labrador Inc. mentioned that because different fish species are interdependent in their feeding, it would be difficult to predict how the species composition might change from the loss of a particular food ingredient or habitat type during the long transition period. Another participant also talked about repercussions for brook trout, ouananiche and lake trout feeding and if prey fish with their short lifespans were unsuccessful in multiple spawning seasons and potentially eliminated in large numbers. A number of participants said that once the reservoirs were created the fish assemblage would be dominated by pike because they would thrive in the lake-like conditions.

6.6.3 Panel Conclusions and Recommendations

The Panel concludes that it is likely that all species now present would be able to survive in the new reservoirs, though perhaps in considerably reduced numbers. However one or two species, that are less tolerant of high turbidity and require highly oxygenated waters often found in tributaries, could be adversely affected, particularly in the Muskrat Falls reservoir, and potentially disappear. The most crucial factor in ensuring a stabilized and relatively unchanged fish assemblage would be the success of the compensation strategy. However, the Panel has concluded that there is considerable risk that lost habitat would not be effectively replaced. Entrainment, not deemed a significant impact in its own right, could add additional losses to an already stressed population.

The Panel acknowledges that construction of Muskrat Falls reservoir first, without an overlap with Gull Island, would permit more time for monitoring and an opportunity to assess how successful habitat replacement is in this environment and whether effective adaptive management is possible.

The Panel concludes that the final fish assemblage cannot be predicted with certainty and there is a risk that one or more species, particularly valued from a community and Aboriginal perspective, could be lost or considerably reduced in numbers because of the:

- number and magnitude of changes expected in water quality, availability of food, temperature, and habitat during the transition period and beyond;

- difficulty of predicting how these variables will interact and how the various species and their life stages will respond and interact in an ecosystem context; and
- potential for some aspects of the compensation strategy to be unsuccessful and the likely difficulty with implementing effective adaptive management after inundation.

The Panel concludes that because of uncertainty about the effects on fish and fish populations caused by the number and scale of changes in the aquatic environment as a result of reservoir creation, the uncertainty about the effectiveness of habitat compensation, and the risk that at least some of the fish habitat lost would not be effectively re-created, the Project would result in a potentially irreversible, significant adverse environmental effect to fish habitat and the final fish assemblage in both reservoirs.

6.7 EFFECTS DOWNSTREAM OF MUSKRAT FALLS

6.7.1 Nalcor's Views

Flow Dynamics

Nalcor explained that its decision to exclude Goose Bay and Lake Melville from the assessment area was based on a review of earlier studies addressing baseline factors in this area. The EIS described changes to downstream flow patterns, water quality, and effects on aquatic organisms immediately below the Muskrat Falls dam and into Goose Bay and Lake Melville. Nalcor predicted that immediately downstream of Muskrat Falls there would be a deepening of the channel and an increase in both shoreline erosion and sediment deposited in the sections of the river closer to Happy Valley-Goose Bay and Mud Lake. However, its climate change modelling showed that an eventual rise in sea level would offset prospective sediment deposition and that water depth at the mouth of the river was expected to increase up to 0.3 metres. Nalcor concluded that none of these effects would be significant but committed to monitoring shoreline erosion rates downstream from Muskrat Falls.

Nalcor noted that the Churchill River was already partially regulated by the Churchill Falls project and that flows downstream of the Muskrat Falls reservoir after impoundment would remain essentially the same as before impoundment. Nalcor predicted that there would continue to be increased flows during the spring because the reservoirs would have limited storage capacity so that the amount of water released from the Churchill Falls Power Station would also be released at both the Gull Island and Muskrat Falls facilities. The exception would be the drawdown before the spring thaw each year. In addition, unregulated tributary inflows below Muskrat Falls would provide a measure of downstream flow variation. Nalcor assessed the change in seasonal flow dynamics and concluded that the Project would have no measurable effect on current fish productivity within the main stem below Muskrat Falls, in the Goose Bay estuary or in Lake Melville.

Nalcor noted that the majority of the substrate downstream of Muskrat Falls is uniform sand and not conducive to spawning by salmonids or other species residing there, such as suckers. Therefore, a complete loss of a cohort of fish as a result of reduced flows was unlikely.

Nalcor's position regarding sequencing effects is discussed in Chapter 4. It did however predict that the stretch of river downstream from Muskrat Falls would be subject to dewatering twice as

the two reservoirs are filled separately. Any effects on spawning habitat downstream would be temporary.

Water Quality

Because post-Project flow volumes and water levels were predicted to be similar to current flows, Nalcor stated that salinity profiles and velocities within the main stem and out through Goose Bay to Lake Melville would not be affected. Nalcor's saltwater intrusion model, conservatively run without incorporating the 30 percent compensation flow during impoundment, revealed no significant saltwater intrusion below Muskrat Falls. With a 30 percent mean annual flow compensation release during the filling of both reservoirs, intrusion of higher salinity water was predicted to remain near its natural extent at the mouth of the lower Churchill River regardless of the sequencing of Project phases. Nalcor thereby concluded that there would be no additional stress on any saline intolerant fish species from the Project.

Nalcor predicted that water temperature changes below Muskrat Falls would be small and localized and would have no effect on ice cover development in Goose Bay and Lake Melville. Since Goose Bay is subject to tidal fluctuations, Nalcor predicted that daily tidal mixing would disperse the fresh water flowing in from the lower Churchill River. Thus, temperature changes would have only a local effect at the mouth of the lower Churchill River and the Goose Bay delta. Further discussion regarding effects of water temperature changes, including ice dynamics, on human activity are discussed in Chapter 8 and Appendix 5.

Nalcor's predictions regarding temporary increases in total suspended solids and total phosphorus downstream of Muskrat Falls were similar to predictions for the reservoirs (as described in Section 6.2.) Nalcor's models predicted concentrations to fall within baseline levels thus within natural variability in the mainstem. Since predictions showed no measurable effects on fish and fish habitat in the mainstem, Nalcor applied this logic to Goose Bay and Lake Melville which again, would result in no measurable effects. A short-term (days) pulse of increased suspended solids during dam construction was expected but little difference in downstream solids levels was anticipated before and after impoundment because much of the solids were expected to settle out in the reservoirs. During the construction period, suspended solids were predicted to settle out within several kilometres of construction sites, and therefore were not anticipated to be detected at the mouth of the Churchill River nor Goose Bay and beyond. Water quality modelling predicted that total suspended solid concentrations below Muskrat Falls, once operational, would fall within the range of baseline variability. Models showed that suspended solids were also likely to be dispersed by inflows or settle out in Goose Bay due to reduced water velocities compared to the river and to the hydraulic control caused by the Goose Bay Narrows.

Total phosphorus below Muskrat Falls was predicted to increase above baseline levels but fall back to baseline levels by the eleventh year. Dispersion modelling indicated no measurable increase in total phosphorus was anticipated beyond Goose Bay harbour limits (west end of Lake Melville). Any total phosphorus above baseline values not rapidly assimilated by aquatic organisms was predicted to be dispersed by inflow from other rivers below Muskrat Falls and entering Goose Bay and/or utilized by phytoplankton, algae and other aquatic vegetation prior to entering Lake Melville.

Any model related uncertainties in the total phosphorus, suspended solids or transport distances did not affect the predictions related to any Valued Ecosystem Components or key indicators.

Nevertheless, Nalcor committed to collect more baseline data on nutrients and phytoplankton in the lower Churchill River, Goose Bay and Lake Melville. Nalcor indicated that it did not expect elevated nitrogen input downstream to result in algal blooms, but would consider monitoring this parameter. If a bloom occurred, Nalcor would consider adaptive management but did not identify any specific measures. Nalcor committed to discussing potential monitoring and follow-up programs with each Aboriginal group, including the Nunatsiavut Government, but declined to commit to funding the Nunatsiavut Government's ArcticNet water quality monitoring program in Lake Melville because Nalcor said it would be working with all stakeholders to develop suitable monitoring and follow-up programs.

Most of Nalcor's initial temperature modelling assumed the original Project sequencing with Gull Island being constructed first. If Muskrat Falls were to be constructed first, the original model calculations might overestimate probable peak values for the Muskrat Falls reservoir and downstream. Without the influence of the Gull Island reservoir on heat retention and release, the predicted thermal variability in and downstream of Muskrat Falls reservoir would initially be moderated between the existing and the final predicted regime with both reservoirs in place. Overall, Nalcor considered these model results still valid regardless of the construction sequence.

Productivity

Nalcor predicted that phytoplankton within the reservoirs and main stem upstream of Muskrat Falls would rapidly assimilate available phosphorus, and therefore any increased production of marine phytoplankton and zooplankton below Muskrat Falls was expected to be minor. If planktonic food did increase downstream, those fish species (lake whitefish and lake chub) and bottom dwelling invertebrates adapted to consuming this food would typically benefit. Secondary beneficiaries such as northern pike and burbot would likely benefit from an increase in lake whitefish and lake chub. Nalcor also concluded that any increase in fish productivity from upstream influences would most likely occur in the freshwater portion of the lower Churchill River below Muskrat Falls.

Overall, Nalcor concluded that there would be no measurable long-term changes to fish productivity, or large-scale shifts in the fish assemblage below Muskrat Falls, although there could be some short-term changes caused by the spike in suspended solids and nutrients after impoundment. To further improve on its existing baseline information, Nalcor committed to monitor fish growth, condition, fecundity, trophic feeding and age structure in the lower Churchill River from Muskrat Falls to the Churchill River delta area. Since Nalcor's models predicted no change to ice conditions in Goose Bay or Lake Melville it therefore concluded that seal interactions with the Project would be minimal.

Mercury

Nalcor predicted that mercury levels would increase after impoundment in water and plankton downstream to the mouth of the river and into the Goose Bay narrows. Methylmercury levels would increase in fish downstream to and including Goose Bay, but levels would be lower compared to fish in the reservoirs with the exception of piscivorous fish feeding below the tailrace of Muskrat Falls. Mercury would not be detectable beyond Goose Bay because concentrations in the water would be gradually diluted, sediments would settle, and plankton and zooplankton die-off before or at the saltwater interface. Effects of elevated mercury levels associated with piscivores feeding on entrained fish would only be seen fairly close to the tailrace area below Muskrat Falls. In any case Nalcor predicted that at no time would fish

methylmercury reach a level to affect fish health or behaviour at a population level. Peak methylmercury levels were expected to return to baseline levels within 35 years.

In 2006, Nalcor conducted a seal abundance and distribution survey concurrently with an ice dynamics study to assess the potential Project interaction with seals. Results indicated that the use of ice by seals (primarily for whelping and molting) was concentrated at the east end of Lake Melville and therefore away from the Project's influence. This observation, along with no predicted change to ice conditions in either Goose Bay or Lake Melville, led Nalcor to conclude that seals would not suffer any health effects from the Project.

Nalcor stated that a more extensive assessment of cumulative effects of mercury levels associated with the Churchill Falls hydroelectric project was not necessary. Nalcor acknowledged some uncertainties associated with its modelling and the state of knowledge about bioaccumulation and the fate of mercury in the ecosystem that limited its ability to make accurate predictions of potential increases in methylmercury in Lake Melville. However, Nalcor said its methylmercury modelling in the downstream environment was sufficient for planning and assessment purposes.

Nalcor responded to the Nunatsiavut Government's critique of its downstream mercury evaluation by stating that the Nunatsiavut Government had not sufficiently reviewed all of the relevant background information, and that Nalcor's modelling approach provided the necessary level of predictive capacity required to determine downstream methylmercury concentrations. This would be backed up by Nalcor's commitment to monitoring and follow-up to verify predictions, address uncertainty, and incorporate adaptive management. Nalcor did not identify specific mitigation to address downstream effects from mercury other than consumption advisories, but committed to work with Aboriginal stakeholders to monitor mercury in fish and seals downstream.

Nalcor concluded that minimal changes in flow regime of the river, combined with the diluting influence of several other tributaries below Muskrat Falls would result in no measurable Project effects downstream of Muskrat Falls on suspended solids, phosphorus, fish productivity, salinity, velocity, temperature, ice dynamics, seal distribution, bank stability, and fish habitat utilization. Nalcor defined no measurable effect as being within the range of natural variability. Any uncertainty in key predictions would be addressed through the monitoring program.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to downstream effects included the following:

- collect more baseline data on nutrients and phytoplankton in the lower Churchill River, Goose Bay and Lake Melville;
- monitor fish growth, condition, fecundity, trophic feeding and age structure in the lower Churchill River from Muskrat Falls to the Churchill River delta area;
- monitor fish habitat utilization in the lower Churchill River, Goose Bay and Lake Melville;
- work with Aboriginal stakeholders to monitor mercury in fish and seals downstream of Muskrat Falls;
- collect more baseline data on mercury levels in estuarine fish and seals downstream of Muskrat Falls and in Goose Bay; and
- monitor injury and mortality rates from entrainment of fish below Muskrat Falls under normal operating conditions.

6.7.2 Participants' Views

Participants raised concerns about the exclusion of Goose Bay and Lake Melville from the assessment area, changes to erosion and deposition downstream, mercury accumulation, including entrainment effects, in fish and seals, and changes to ice formation. Fisheries and Oceans Canada said that Nalcor had provided insufficient rationale for this decision and the Nunatsiavut Government organized many of its presentations around the issue of what it stated to be inadequate assessment of downstream effects.

Participants from the community of North West River raised concerns that Grand Lake had experienced saltwater intrusion as a result of the Churchill Falls project which adversely affected certain fish species in Grand Lake.

Fisheries and Oceans Canada recommended that Nalcor collect baseline data and conduct post-project monitoring on nutrients and primary production levels in Lake Melville to address uncertainties in its predictions. The Nunatsiavut Government stated that Nalcor had only addressed phosphorus, the limiting nutrient in a freshwater environment, and had neglected nitrogen, silicates and other nutrients that are important indicators in marine environments. It also recommended that Nalcor consider fulfilling ongoing baseline and effects monitoring requirements by providing funding to the ArcticNet research program in Lake Melville with a focus on water temperature, salinity and primary production.

Fisheries and Oceans Canada questioned the certainty of Nalcor's downstream analysis of effects on fish because of an over-reliance on modelling that did not always use values drawn from baseline sampling. It therefore recommended that Nalcor collect more baseline data, and after impoundment monitor changes in fish growth, condition and spawning times between Muskrat Falls and the Churchill River delta area.

Participants raised concerns that Nalcor did not fully investigate potential effects of temperature changes on the ice regime in Lake Melville and consequently on seal habitat. The Nunatsiavut Government and other participants criticized Nalcor's 2006 seal survey in Lake Melville as inadequate noting that it was carried out in an atypical year when there was an early spring with no ice in the Churchill River below Muskrat Falls and poor ice in Lake Melville. Rigolet community members also contradicted Nalcor's statement that seals were rarely found in the river near Muskrat Falls, listing several species of seal including ringed seals observed in this area. Their view was that marine mammal distribution and abundance is often variable from year to year and within years due to fluctuation in ice habitat or changes in location of adequate food sources. A number of participants requested that further studies be done on seal distributions downstream of Muskrat Falls.

Fisheries and Oceans Canada released a research paper showing that mercury effects from the Churchill Falls project could be seen in several estuarine species (rainbow smelt, tomcod, sea trout) in the waters of Lake Melville over 300 kilometres away from the Smallwood Reservoir. It expressed concern about the absence of downstream sampling of primary producers and macrobenthos because of their potential to bioaccumulate mercury. Fisheries and Oceans Canada therefore recommended that Nalcor develop a comprehensive program to monitor spatial and temporal changes in mercury in fish within the reservoirs and downstream including at Goose Bay following reservoir creation. The frequency and timing of sampling should support a clear assessment of the magnitude and timing of these changes, and inform determinations of risks to human health and implementation of related fisheries management measures. More baseline data should be collected on mercury levels in estuarine fish downstream of Muskrat Falls and in Goose Bay in advance of inundation.

The Nunatsiavut Government stated that methylmercury would travel downstream in zooplankton and would ultimately accumulate in seals in Lake Melville via smelt. It criticized Nalcor's methylmercury modelling and its conclusions with regard to levels of increased concentrations in fish and seals in Lake Melville, noting that sea-run brook trout can travel between fresh water and Lake Melville. The Nunatsiavut Government concluded that, before definitive conclusions could be reached on any trends in downstream methylmercury levels or their measurable effects, Nalcor should collect more data on suspended solids and fish and seal movements, and conduct a better analysis of mercury. Traditional knowledge showed that seals were present in the main stem of the river as well as Goose Bay and Lake Melville.

6.7.3 Panel Conclusions and Recommendations

The Panel acknowledges that Nalcor had drawn on a wide range of earlier studies covering areas downstream of the Project's assessment area, but observes that during the course of the review Nalcor qualified its predictions of no effect in response to information requests, additional studies, and input during the hearings. Nalcor initially predicted 'no measurable effect', and later defined this as 'no effect outside the range of natural variability'. The Panel observes that this definition is imprecise. For example, natural variation could produce a wide range of values within an average year. A change caused by the Project could result in a measured parameter showing values at the top end of a range for the entire year and still fit within the above definition.

The Panel notes that information on the location and extent of spawning habitat downstream from Muskrat Falls would show the extent of possible adverse effects of dewatering on fish eggs and fry if impoundment were to occur when they were present.

The Panel acknowledges that there is limited literature on downstream, estuarine effects of hydro projects in a boreal region, and that reports cited by a number of participants may be of limited applicability given the particular characteristics of the Lower Churchill Project. This lack of information drawn from previous projects was likely compounded by Nalcor's decision to place the study boundary at the mouth of the river and therefore not carry out baseline sampling in Lake Melville.

Therefore, the Panel cannot confidently conclude what the ecological effects would be downstream from Muskrat Falls, and particularly in the estuarine environment of Goose Bay and Lake Melville. Nalcor has placed much confidence in the fact that flows would remain very similar to pre-project conditions, but acknowledged that the reservoirs would act as sediment and nutrient sinks and that the Churchill River provides a high percentage of the flows into Goose Bay and Lake Melville, suggesting that in the long-term measurable effects would likely be observed.

The Panel concludes that Nalcor's assertion that there would be no measurable effect on levels of mercury in Goose Bay and Lake Melville has not been substantiated. Evidence of a long-distance effect from the Churchill Falls project in estuarine species clearly indicate that mercury effects can cross from freshwater to saline environments, in spite of Nalcor's assertions to the contrary. The Panel also concludes that Nalcor did not carry out a full assessment of the fate of mercury in the downstream environment, including the potential pathways that could lead to mercury bioaccumulation in seals and the potential for cumulative effects of the Project together with other sources of mercury in the environment. Because Nalcor did not acknowledge the risk that seals could be exposed to mercury from the Project, it did not address whether elevated mercury would represent any threat to seal health or reproduction.

The significance of the potential for downstream mercury effects on Aboriginal and non-Aboriginal land and resource use, and on human health and communities is discussed in Chapters 8, 9, and 13.

The Panel is not convinced that all effects beyond the mouth of the river will be “non-measurable” as defined by Nalcor (within natural variability). The Panel concludes that downstream effects would likely be observed in Goose Bay over the long term caused by changes in sediment and nutrient supply and in water temperature. Effects in Lake Melville are more difficult to predict on the basis of existing information. The Panel acknowledges that there is difficulty in accurately predicting the scale of effects given the absence of long-term ecological studies of the effects of hydroelectric projects in northern environments on receiving waters. However, the Panel believes that this emphasizes the need for a precautionary approach, particularly because no feasible adaptive management measures have been identified to reverse either long-term adverse ecological changes or mercury contamination of renewable resources.

With the information before it, the Panel is unable to make a significance determination with respect to the risk of long-term alteration of ecological characteristics in the estuarine environment. The Panel concludes that there is a risk that mercury could bioaccumulate in fish and seals in Goose Bay and possibly in Lake Melville populations as well but would probably not represent a risk to the health of these species. The implications on health and land use are addressed elsewhere, but the following recommendation addresses the need to take a precautionary approach to reduce the uncertainty regarding both the potential ecological and mercury effects downstream.

RECOMMENDATION 6.7 Assessment of downstream effects

The Panel recommends that, if the Project is approved and before Nalcor is permitted to begin impoundment, Fisheries and Oceans Canada require Nalcor to carry out a comprehensive assessment of downstream effects including:

- identifying all possible pathways for mercury throughout the food web, and incorporating lessons learned from the Churchill Falls project;
- baseline mercury data collection in water, sediments and biota, (revised modelling taking into account additional pathways, and particularly mercury accumulation in the benthos) to predict the fate of mercury in the downstream environment;
- quantification of the likely changes to the estuarine environment associated with reduction of sediment and nutrient inputs and temperature changes; and
- identification of any additional mitigation or adaptive management measures.

The results of this assessment should be reviewed by Fisheries and Oceans Canada and by an independent third-party expert or experts, and the revised predictions and review comments discussed at a forum to include participation by Aboriginal groups and stakeholders, in order to provide advice to Fisheries and Oceans Canada on next steps.

If the Project does proceed the Panel observes that Nalcor has both an opportunity and a responsibility to contribute to the knowledge about short and long-term effects of hydroelectric projects on downstream environments. The Panel acknowledges that Nalcor has committed to make monitoring data public but often lessons learned from environmental effects monitoring of large projects are obscured because the results are not fully analyzed and remain difficult to access in the “gray literature”. The Nunatsiavut Government requested that Nalcor participate in the ArcticNet research program as a funding partner. While not making this a formal recommendation, the Panel would encourage Nalcor to explore this option with the Nunatsiavut

Government to see if it could provide a cost-effective way to address baseline sampling and ongoing monitoring, combined with the added value of participating in a broader program.

RECOMMENDATION 6.8 Published analysis of downstream effects over time

The Panel recommends that, if the Project is approved, Nalcor contribute to the overall knowledge about the effects of hydroelectric projects in northern regions by ensuring that a longitudinal analysis of the effects of the Project on the downstream environment (Goose Bay and Lake Melville) over an appropriate time period, including both mercury transport and bioaccumulation and other ecological parameters, is published in a peer-reviewed journal or the equivalent. The Panel suggests that Nalcor consider collaborating with an appropriate independent research organization to carry out this recommendation by providing knowledge, data and financial resources.

6.8 MONITORING, FOLLOW-UP AND ADAPTIVE MANAGEMENT

6.8.1 Nalcor's Views

Nalcor outlined its proposed aquatic environment monitoring program in the Fish Habitat Compensation Strategy. Measurable parameters would include habitat stability (bank erosion, sediment transport, and ice formation) and habitat suitability (physical, chemical and biological features).

Nalcor stated that it had considerable experience in monitoring fish habitat compensation works at other sites, and that an appropriate and effective monitoring program could be designed and implemented for both incidental and created habitat. Nalcor reiterated that long-term monitoring was crucial to assessing the accuracy of its predictions and to aid in mitigation and adaptive management planning. Nalcor emphasized that the monitoring and follow-up programs proposed during the Panel review process were still at a preliminary stage. Once a decision was made to proceed with the Project, Nalcor would incorporate input from the environmental assessment process into its detailed Project plans.

Nalcor also committed to develop, in consultation with Fisheries and Oceans Canada, specific cautionary or critical levels for various biological and physical parameters to act as thresholds for triggering any prospective adaptive management measures in order to maintain the overall productivity of fish habitat.

Nalcor's monitoring commitments included collection of additional baseline data for a minimum of five years beginning in 2010 at the proposed Muskrat Falls and Gull Island reservoir sites, and in Lake Winokapau, prior to impoundment. The purpose of this program was to strengthen baseline information used to evaluate the effectiveness of its proposed compensation works as well as to address adaptive management requirements. This detailed field program was developed in conjunction with regulatory authorities, academics and stakeholders, and looked at habitat parameters including: phytoplankton abundance, total suspended solids, total phosphorus, water temperature, and bank stability. Fish parameters measured included fish habitat utilization, growth, egg production, and analysis of the feeding levels within the food chain.

Nalcor also planned to monitor compensation works for substrate placement, habitat stability (including the monitoring programs for bank erosion, sediment transport and ice formation), habitat suitability, and utilization by invertebrates and fish in a timeframe to be established in consultation with Fisheries and Oceans Canada and based on monitoring results.

Nalcor agreed with Fisheries and Oceans Canada's request for additional monitoring data with the exception of the time frame of 25 years. Nalcor's position was that the length of the monitoring time frame should be established in consultation with Fisheries and Oceans Canada based on ongoing monitoring results.

6.8.2 Participants' Views

Fisheries and Oceans Canada indicated that, although the reservoirs could become healthy aquatic ecosystems and support sustainable fisheries, it was uncertain how long this would take. It therefore recommended that baseline data be collected for a minimum of five years prior to impoundment in order to better describe natural variability of the aquatic ecosystem. This information should be used to update predictions regarding the amount of habitat available after reservoir creation, and to adjust the compensation strategy as required. Monitoring programs for both the incidental habitat and the physical compensation works should be designed to evaluate stability, functioning and productivity of habitats for a minimum of 25 years.

A number of participants questioned whether effective monitoring and adaptive management was feasible and how habitat compensation works could be monitored on such a large scale. They also questioned what adaptive management measures were realistically available if new habitats did not function as planned.

Innu Nation and other Aboriginal groups criticized Nalcor for not incorporating traditional knowledge into fish habitat assessment and compensation planning.

The Natural History Society was concerned that no specific monitoring plans had been prepared, and indicated that monitoring in Canada had generally been a failure due to the length of the monitoring period being too short or the monitoring not being carried out in a scientific manner. Grand RiverKeeper Labrador Inc. stated its belief that once projects are built, budgetary considerations could lead to monitoring and follow-up phases being truncated therefore a powerful program of monitoring and adaptive measures would be needed to ensure new habitats are maintained for the reproductive life stages of all fish species. This adaptive program would need to continue for a long time after construction was completed.

6.8.3 Panel Conclusions and Recommendations

The Panel observes that the main challenges with Nalcor's proposed monitoring program would likely include:

- adequacy of the baseline data on which it would be based (noting that Fisheries and Oceans Canada has called for an extensive effort to collect better baseline information in advance of and during the construction period);
- level of effort that would be applied;
- setting appropriate thresholds to trigger adaptive management (assuming that measures are available) or compensation;
- determining how long monitoring must be carried out, and
- maintaining effective oversight – both regulatory and community-based – over many years.

Recommendations regarding monitoring are included in Chapter 15. In addition, the Panel recommends that there be Aboriginal, community and independent expert review and input into the development of the monitoring program.

RECOMMENDATION 6.9 Development of the aquatic monitoring program

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to organize a workshop with third-party facilitation and invited participation by Aboriginal groups, stakeholder organizations, knowledgeable local people, and independent experts from academic or equivalent organizations to review and advise on a detailed draft monitoring plan.

6.9 CUMULATIVE EFFECTS**6.9.1 Nalcor's Views**

Nalcor indicated that effects of the Churchill Falls project on the lower Churchill River were reflected in its baseline data, therefore if Project effects were not assessed as significant, the cumulative effects would also not be significant. Nalcor responded to Panel requests for more information by describing the previous hydroelectric projects in the watershed but was unable to provide baseline information about the river before any hydroelectric development had taken place.

In responding to concerns about cumulative effects from the Churchill Falls project Nalcor explained that the footprint of the lower Churchill reservoirs would be considerably smaller, the operating regime and operating philosophy would be different; and the Project would not involve diverting other river systems, as was done for the Churchill Falls development. Nalcor also added that the Project would flood an area equivalent to only five percent of the area inundated for the Churchill Falls development. In addition, the results of the cumulative environmental effects analysis as presented in the EIS would not likely change as a result of a change in the sequencing of Project phases.

Nalcor stated that climate change issues had been incorporated into its predictive temperature models in response to participant concerns regarding the cumulative effects of climate change and the Project on the aquatic environment. When questioned regarding the potential for effects on fish spawning because of the combined effect of reservoir creation and climate change on water temperature, Nalcor indicated that this would not alter spawning time or success.

6.9.2 Participants' Views

Numerous participants raised concerns related to the cumulative effects of the Churchill Falls development in combination with the proposed Project. Fisheries and Oceans Canada's opinion was that Nalcor's approach to cumulative assessment was appropriate and that the precautionary principle had been observed.

Grand RiverKeeper Labrador Inc. voiced its concern that for every environmental concern raised by participants, Nalcor predicted that negative impact would be minimal or short term and no significant changes would occur to fish habitat, Grand RiverKeeper was concerned that these predictions were wrong.

Some participants indicated that they had observed a number of changes in Lake Melville following the Churchill Falls project related to river diversion and were concerned about a repetition of these changes and its potential cumulative effect.

Participants voiced concerns that climate change effects were not properly assessed. The provincial Department of Environment and Conservation stated that it would review and approve any Lower Churchill Project-related climate change adaptation procedures.

6.9.3 Panel Conclusions and Recommendations

The Panel acknowledges the difficulty of assessing the cumulative effects of a proposed project in relation to a past project when there is little or no data to describe baseline conditions before the earlier project's inception. For a situation where effects are additive and can be measured against an objective standard, such as water quality guidelines, Nalcor's approach is adequate. However the Panel was not presented with information that would allow assessment of, for example, the cumulative effects on fish populations and composition because Nalcor did not describe how partial regulation of the lower Churchill River by the Churchill Falls project might have changed habitats, water quality and the fish that depend on them.

The Panel observes that water quality conditions and subsequent effects on biota appear to have stabilized in the years since the Smallwood Reservoir was created with the exception of methylmercury in top level predators, which may result in extending the period of time during which methylmercury would be elevated in some fish. The other obvious cumulative effect on the aquatic environment would be that the Churchill River watershed, now only partially regulated below Churchill Falls, would be fully regulated downstream to Muskrat Falls. Further Panel observations on Nalcor's approach to cumulative effects may be found in Chapter 16.

The Panel notes that temperature increases related to climate change may interact with water temperature changes resulting from reservoir formation. In the spring, a warming influence through climate change might offset the cooler water temperature regime in the reservoirs and reduce potential adverse effects on primary production and as a result, fish productivity. In the fall, climate change might increase the warming effect on reservoir water temperatures and, depending on the extent, have a negative effect on fall spawning. Given the uncertainty around the scale of climate change effects, the outcome is difficult to predict, thus reinforcing the need for ongoing monitoring.

7 TERRESTRIAL ENVIRONMENT AND WILDLIFE

This chapter discusses the key effects of the Project on the terrestrial environment, including effects on terrestrial ecosystems, such as riparian, wetland and ashkui ecosystems, rare plants, caribou, birds, other wildlife and seismic and geotechnical effects. Many of the terrestrial species covered in this chapter were noted to be of particular importance to Aboriginal communities. Examples include various caribou herds, small game, medicinal plants and berries. The social and cultural importance of these species and the effects of the Project on hunting, trapping and gathering are considered in Chapters 8 and 9.

7.1 TERRESTRIAL ECOSYSTEMS

7.1.1 Nalcor's Views

Nalcor identified ten habitat types in the terrestrial assessment area and noted the amount of habitat lost as it related to each key indicator species. These habitats included riparian, wetland, dry black spruce/lichen, wet black spruce/moss, white spruce/mixed-wood, fir-spruce, hardwood, balsam fir/mixed-wood, black spruce/mixed-wood and other. The effect of the Project on riparian and wetland habitat is discussed separately in Section 7.2.

Nalcor stated that physical disturbance from the Project on the terrestrial environment would consist of 161 square kilometres through the creation of the two reservoirs and associated components. Change in habitat for the purposes of Nalcor's assessment included physical disturbance such as site clearing, which could represent a long-term or permanent change, as well as temporary disturbances due to noise levels, dust and human presence.

Nalcor stated that although there would be some habitat change or loss for all key indicator species, this was not expected to influence the sustainability of any population. Construction and reservoir creation would be the largest contributor to habitat change, whereas changes after construction and impoundment would be minimal. Environmental effects would be adverse but not significant. In general, the Project would account for low magnitude effects in terms of habitat loss for each key indicator species since the amount of primary habitat affected by the Project accounts for a small portion of the total primary habitat available within the terrestrial assessment area. In response to concerns regarding the effects of habitat loss stemming from the Churchill Falls project, Nalcor indicated that there would be much less habitat loss caused by this Project because its footprint would be much smaller.

Nalcor stated that its planned method of timber and shrub removal under a partial clearing regime would occur around the perimeter of the reservoirs in areas where it was safe and technically feasible. During clearing, buffer zones would be left to maintain riparian areas and provide habitat to terrestrial waterfowl and raptors. The partial clearing regime would also maintain cover for birds, small mammals, and herpetiles during the construction period, as well as protection for breeding waterfowl and wetland sparrows. Further discussion on clearing regimes is provided in Chapter 4.

Geomorphological Issues

Nalcor stated that localized slope failures downstream of the facilities would be common until the establishment of a stable beach, inshore and bluff along the shoreline. Minimal shoreline erosion was expected within the Gull Island Reservoir, limited to undermining of the shoreline

and small slides and falls. Shoreline erosion would be more extensive in the Muskrat Falls reservoir, and stabilization would take several decades.

At the Muskrat Falls site, the north spur forms a natural dam connecting the north bank of the river valley to the rock knoll. Because of instability in the area following a landslide in the 1980s, Nalcor currently operates a pump system to maintain stability. Pumping has drawn down the groundwater in the spur and additional measures would be developed during detailed design and construction to further improve stability.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to terrestrial habitats and geomorphological issues included the following:

- conduct additional field investigations to design a seepage control measure on the north spur and revise this measure as necessary;
- develop formal draw down procedures for various operating conditions to ensure safe operation of the Project;
- regularly inspect and maintain the spur stabilization measures and examine the area for unexpected seepage, piping, ground cracking and any indications of ground instability;
- monitor bank recession rates along the lower Churchill River downstream of Muskrat Falls;
- conduct stability analysis once the Project is at the detailed geotechnical design phase; and
- monitor bank erosion within the new reservoirs using remote sensing, direct measurements and real time weather/wave measurements.

7.1.2 Participants' Views

Participants stated that old-growth forest was an important part of the ecosystem and that preservation of this habitat type should be a priority for international organizations and the Province. They also expressed concern that old-growth forest was not assessed as a key indicator by Nalcor.

The provincial Department of Natural Resources stated that, from a forest management perspective, old-growth forest was defined based on forest structure, species composition and height and the majority of District 19 was classified as old-growth forest. Therefore, it noted that the Project footprint would not significantly impact the amount of old-growth forest in the District.

Grand RiverKeeper Labrador Inc. countered that the old-growth forest in the river valley was not comparable to old-growth forest in the rest of the District and there was a moratorium on cutting in the valley because of the pristine nature of the forest and the size and quality of the trees present there.

Many participants expressed concerns over habitat loss and the effect on wildlife. Habitat loss for wetland sparrows, surf scoter and caribou were particular concerns.

Participants also expressed concerns about bank erosion and how the resulting loss of habitat would affect wildlife. Fisheries and Oceans Canada stated that because Nalcor used literature values and estimates for the slope stability study rather than using actual soils and overburden data from the Project area, predictions related to the timing of re-stabilization were uncertain, and in other reservoirs bank stabilization had taken up to 30 or 40 years.

Other participants expressed concerns that wildlife would be displaced from shoreline habitat during the period of stabilization, possibly to areas where unoccupied habitat might not be available, resulting in population reductions.

Participants commented on the instability of the north spur at Muskrat Falls and doubted that the bank would become stable within the period identified by Nalcor. They were concerned that field studies had not been completed on the stability of the reservoir edge and landslides could occur. Natural Resources Canada recommended that Nalcor complete a follow-up program, which would include monitoring bank recession rates remotely.

Several participants expressed concerns about the cumulative impact of climate change and the Project. Participants noted that climate change may affect distribution of plants and wildlife and noted that the Project may exacerbate effects on species at risk or uncommon species. In particular, Innu Nation noted that climate change could affect the success of Nalcor's proposed habitat mitigation.

7.1.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on habitat change, the Panel considered the following factors to be particularly relevant:

- the relatively pristine condition of the terrestrial environment in the Project area, generally undisturbed by human influence; and
- the scale of the area affected by the Project and the resulting loss in overall terrestrial habitat, including its impact on habitat diversity, ecosystem diversity, and the loss of old-growth forest in the river valley.

The Panel has concluded that given the scale of the Project, and particularly given the scale of terrestrial habitat that would be inundated by the Project, it is important to consider habitat loss itself as an environmental effect in addition to considering the effect of the loss of habitat on individual species. The significance of the loss of terrestrial habitat, including old-growth forest and wetland and riparian habitat, are therefore considered first, together with the effect of this loss on biodiversity and ecosystem resilience. The effect of the loss of these habitats and other stresses on individual species is then assessed.

The Panel concludes in light of the scale of terrestrial habitat that would be inundated by the Project and the permanence of the effect, that the overall loss of terrestrial habitat is significant.

The Panel concludes that as a result, habitat biodiversity and the overall integrity of terrestrial ecosystems would be affected by the Project, particularly when considered in combination with other developments that have already taken place, the likelihood that there will be further resource extraction development in the area in the future, and the stress imposed on the terrestrial environment as a result of the shifting climate patterns resulting from climate change.

The overall loss of terrestrial habitat cannot be mitigated. At best, there are opportunities to ensure that some of the most important services provided by the habitat to be lost would be replaced in the surrounding area.

7.2 RIPARIAN AND WETLAND HABITAT

7.2.1 Nalcor's Views

Nalcor noted the importance of wetland habitats including riparian marsh for several key indicator species. Wetland habitats provide foraging, nesting and breeding habitat for several types of large mammals, furbearers, herpetiles and birds. Wetlands were noted as widespread and common in the lower Churchill River watershed (estimated at approximately 900 square kilometres of wetlands) and wetland habitat within the Project area comprised 2.4 percent of the total habitat. As a result of the Project, Nalcor indicated that approximately 60 percent of this habitat would be inundated, of which 98 percent was the uncommon riparian marsh ecotype.

Reduced fluctuations in water levels at the new reservoir shoreline would limit the ability of riparian marsh vegetation to re-establish naturally. As a result, Nalcor committed to creating new riparian habitat similar to that lost through inundation. Nalcor stated that effects resulting from the loss of riparian wetlands would not be significant and implementing the objectives of the No-Net-Loss policy for wetlands of the Government of Canada would be cost-prohibitive and unnecessary in the absence of any predicted significant effects. Riparian habitat creation could be done passively by partially clearing a 15-metre strip along the new shoreline to enable riparian species to re-establish naturally, or actively, by creating new features along the shoreline conducive to the establishment of riparian habitat.

Nalcor responded to concerns from participants who questioned whether riparian wetlands lost through inundation could be replaced with equally functional habitat due to the difficulty of mimicking the natural annual and seasonal variations in water levels on a regulated river. Nalcor stated that there would be an opportunity to capture some of the spring runoff to raise the water level in the reservoirs, above the full supply level, and then gradually releasing it, thereby providing a modified version of the natural process. This would encourage riparian habitat formation and function. Additional information on the effect of riparian habitat loss on wildlife is discussed in Section 7.6

Nalcor expressed confidence in its ability to successfully reproduce lost riparian marsh wetlands and noted that other unaffected wetland habitats in the area, such as bogs, fens, marshes and swamps, would continue to fulfill the same array of wetland functions for wildlife. Nalcor cited successes in several other projects where riparian marsh had been re-established, including the Peace-Athabasca Delta Restoration, Limestone Wetlands Habitat Restoration and Creation Program and various Ducks Unlimited Canada Projects. Nalcor noted that it had researched vascular plant communities associated with riparian zones and the technique to be used for the Project is currently used in other places in North America.

Riparian thicket and meadow ecotypes were identified as important for small mammals and birds due to richness of shrub species, cover and vertical structure. However, Nalcor stated that primary succession vegetation would naturally establish once the shoreline stabilized and eventually a riparian zone similar to the existing thicket ecotypes would be created. Nalcor also noted that these types of riparian habitat have high resilience to natural stresses.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to riparian and wetland habitat included the following:

- create wetland habitat along the riparian fringe of the reservoirs or along watercourses adjacent to the reservoir;

- maintain a buffer around existing tributaries and along the main stem of the river to maintain riparian habitat;
- evaluate the possibility of modifying dam operations to mimic spring flooding to help establish riparian vegetation; and
- monitor created and natural wetland and riparian habitats to evaluate their effectiveness in attracting associated wildlife such as wetland sparrows.

7.2.2 Participants' Views

Participants expressed concerns about the destruction of riparian marsh habitat and indicated that they had little confidence in Nalcor's ability to recreate riparian habitat.

Environment Canada suggested that Nalcor implement a No-Net-Loss policy for wetland replacement and that replacement riparian wetland habitat should have the same function as the habitat lost through inundation, but also noted that there would be alternate habitat outside the Project footprint to help alleviate effects of habitat loss on certain key indicator species. Riparian marsh habitat was described as being difficult to replace but Environment Canada noted that Nalcor's mitigation plans recognized the importance of timing of flood, topography and relationship with the water level.

Innu Nation disagreed with Nalcor that the example provided of wetland creation in the Peace Athabasca delta had been successful. From the perspective of the Aboriginal community living there, wetlands had not been restored to conditions that would support wildlife populations similar to those that existed prior to flow regulation.

One participant suggested that Nalcor demonstrated a limited understanding of the degradation of riparian habitats due to changes in hydrological regimes. She noted that the nature of riparian habitat in a large river system such as the Churchill River was different than that of a small river system and many of Nalcor's examples of success were not comparable to what would be observed with the Project. She stated that with changes in flow regime there would be changes in sediment transport, deposition, erosion processes, nutrients, temperature and moisture regimes that would reduce species diversity and structural complexity of riparian habitats. Nalcor did not account for the effect of the Project on uncommon riparian habitat communities because bogs, fens, marshes and swamps were combined in the study, and therefore predictions on impacts were inaccurate.

Sierra Club Atlantic explained that natural flooding in downstream areas keeps riparian vegetation at an early successional stage which results in a diverse wildlife community. Post-Project runoff would be transferred from the biologically active period of the year (spring) to the biologically inactive period (winter) resulting in an unnatural shift in the ecosystem. The Natural History Society also stated that flow regimes could affect riparian habitats downstream of the Project. The Society noted that increases in saltwater intrusion and erosion of riverbanks downstream of the Muskrat Falls facility would change the density and species composition in those ecosystems. It stated that complex marshlands could be replaced by shrubs, reducing the habitat for wetland birds.

A participant stated that Nalcor had underestimated the challenges and limitations involved in recreating riparian ecosystems and noted that Hydro-Québec had abandoned efforts to mitigate losses of riparian wetlands. She expressed the view that Nalcor had over-estimated the potential to re-establish riparian wetlands in the new reservoirs that would have the same habitat complexity and biodiversity as the existing riparian zone. According to this participant, Nalcor's mitigation measures would only result in a small improvement, and in her view, the

Project would result in a net loss of riparian habitat. In response to Nalcor's proposal to regulate flow in order to mimic a natural flood, she stated that it might be a reasonable option but would not counter the significant reduction in riparian habitat.

One participant asserted that there was inadequate characterization of cumulative effects of multiple hydroelectric projects on riparian habitats within the watershed and the region in general, and questioned how the impact could be classified as not significant considering the large area of complex riparian habitat with high species richness in the lower Churchill River.

7.2.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on riparian and wetland habitat, the Panel considered the following factors to be particularly relevant:

- the scale of the area affected by the Project and the resulting loss in overall riparian and wetland habitat;
- the cumulative effect of the Project in combination with the Churchill Falls project on riparian habitat in the river;
- the particular dependence of wetland sparrows on riparian habitat, which would be flooded at a large scale by the Project;
- the potential benefit of the environmental flows recommended in Chapter 6 to the success of riparian habitat compensation; and
- the scale of the habitat compensation effort required and the uncertainty associated with its success.

Nalcor has identified riparian habitat to be lost by inundation as providing particularly important services to key indicator species, and has proposed the development of detailed habitat compensation plans for riparian marsh. Because wetland habitat generally plays an important role in ecosystem health, it is important to recognize other wetlands that are being lost, not just the riparian marsh that is important to the sparrow.

The Panel agrees that compensation plans, such as that proposed, are critical. However, the Panel is not convinced that there is a high degree of certainty that the compensation efforts with respect to wetland and riparian habitats would be sufficient to mitigate the significant loss of wetland and riparian habitats that would result from inundation. If the Project proceeds, ongoing monitoring and active adaptive management will be critical to the success of riparian and wetland habitat compensation efforts.

RECOMMENDATION 7.1 Wetland compensation plan

The Panel recommends that, if the Project is approved, Nalcor be required to develop a detailed wetland compensation plan in consultation with Environment Canada, the provincial Department of Environment and Conservation, Aboriginal groups and appropriate stakeholders. The plan should set appropriate goals for the re-establishment of wetlands taking into account the purpose served by each type of wetland in the context of the surrounding ecosystem.

RECOMMENDATION 7.2 Riparian compensation plan

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to develop a detailed riparian habitat compensation plan in consultation with Fisheries and Oceans Canada, the provincial Department of Environment and Conservation, Aboriginal groups and appropriate stakeholders, that looks closely at water levels and variations in the levels needed to ensure healthy and resilient riparian habitat

and coordinates with the environmental flow standards referenced in recommendation 6.2.

The Panel concludes that the residual adverse effect of the Project on wetlands and riparian habitats, even with appropriate mitigation, is significant.

7.3 RARE PLANTS

7.3.1 Nalcor's Views

Originally, Nalcor did not identify any listed plant species under the federal *Species at Risk Act* or the provincial *Endangered Species Act* within the footprint of the Project and stated that information on the presence of rare plants in Labrador was limited. In response to concerns regarding the effects of the Project on regionally uncommon plants within Labrador, Nalcor commissioned studies of vascular plant species. Based on the information collected, Nalcor, in conjunction with the provincial Department of Environment and Conservation, identified 28 plant species with limited observations in the area. Of these species, 13 were identified as not having sufficient numbers to be considered common outside the flood zone. In 2010, a follow-up survey identified four species that had a sufficient number of locations (defined as at least five locations separated by at least two kilometres and not at risk of disturbance) and one species that was misidentified in the original survey.

The remaining eight plant species considered potentially regionally uncommon within the Project area were: greater bladder sedge, evergreen woodfern, rattlesnake mannagrass, common woodsorrel, reed canarygrass, Oakes' pondweed, Richardson's pondweed and Canada yew. Nalcor noted, however, that these plants were common in other parts of Canada.

In response to the provincial Department of Environment and Conservation's recommendation that hidden fruit bladderwort and marsh horsetail be added to the eight species, Nalcor agreed to the former, but stated that marsh horsetail was common downstream and would not be affected. In response to a participant's concerns that mountain maple should also be included, Nalcor responded that it had identified several locations of mountain maple in its surveys and did not include it in the list of regionally uncommon plants.

For regionally uncommon plant species noted during the assessment, Nalcor counted the number of observations both within and outside the inundated area and found none of these species were in danger of extirpation (Table 5).

Table 5. Number of observations of regionally uncommon plant species by Nalcor within and outside of the inundated area (Source: adapted from Nalcor)

Common Name	Number of observations outside inundated area	Number of observations within inundated area
greater bladder sedge	0	1
evergreen woodfern	0	1
rattlesnake mannagrass	0	1
common woodsorrel	2	4
reed canarygrass	1	1
Oakes' pondweed	0	1
Richardson's pondweed	0	2
Canada yew	0	4

For each regionally uncommon species identified, Nalcor stated that if sufficient numbers were not identified outside of the footprint, it would relocate these regionally rare plants from the flood zone to suitable habitat already identified outside of the flood zone. It would also consider relocation as a mitigation strategy for any other plant species identified by the Province.

Nalcor identified Canada yew as a regionally rare plant in the Project area. Nalcor acknowledged that Canada yew was used as medicine by several Aboriginal groups and was culturally significant. Nalcor proposed mitigation similar to that for other uncommon plants, whereby it would define suitable locations to relocate and re-establish Canada yew based on habitat and species association. Nalcor proposed follow-up monitoring and indicated that this type of strategy had been successfully implemented by others with other plant species.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to rare plants included the following:

- develop an Environmental Protection Plan for rare plants;
- include hidden fruit bladderwort on the list of regionally uncommon plants;
- relocate Canada yew plants from within the inundated area to an area above the future reservoir limits;
- relocate the regionally rare plants identified from the flood zone to suitable habitat outside the flood zone;
- undertake a follow-up and monitoring program considering Traditional Knowledge for relocated Canada yew plants and implement adaptive management measures as appropriate;
- monitor the relocation success of regionally uncommon plants including Canada yew; and
- develop monitoring plans to monitor rare plants in all stages of the Project to ensure that these species persist in Labrador.

7.3.2 Participants' Views

During the public hearing, participants, including Aboriginal groups, stated that they were concerned about plants in the inundated area, especially plants considered rare including, common woodsorrel and mountain maple, and medicinal plants such as the Canada yew. One participant requested that medicinal plants be investigated and documented before relocation. The effect of the Project on plants and animals of cultural and medicinal importance to Aboriginal communities and other local residents is discussed in Chapters 8 and 9.

The provincial Department of Environment and Conservation recommended that an Environmental Protection Plan be developed for rare plants in the Project area. It concurred that the eight plant species identified by Nalcor, while unique to the river valley, were found elsewhere in Canada. However, it requested that marsh horsetail and hidden bladderwort be included in the Environmental Protection Plan in addition to the species identified.

The Department of Environment and Conservation stated that there were two International Biological Program sites within the Project area, the Lower Churchill site and the Gull Island site. It assessed the Lower Churchill site as representative of black spruce, blackened woodland and unstabilized sand dunes. It explained that the Gull Island site in particular was characterized by rich black spruce forest with records of the common woodsorrel. In terms of conservation status, the Department noted that the Lower Churchill site was of low interest for protection, but the Gull Island site was of higher interest due to the presence of rare plant

species. However, the Department noted that very little of the Gull Island site was expected to be inundated and agreed with Nalcor that inundation of this area would not affect the representative forest types but stated that the mitigation proposed for rare plants should be followed.

7.3.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on rare plants, the Panel considered the following factors to be particularly relevant:

- the limited information available on the presence of potentially rare plant species;
- the prediction that climate change will likely gradually extend the northern range of plant species;
- the presence of species of concern identified by the Department of Environment and Conservation, including rare plants; and
- the presence of a number of species of particular importance to local Aboriginal and non Aboriginal residents, including Canada yew, berries and sweetgrass, among other harvested plants.

Marsh horsetail and hidden bladderwort should be included in the Environmental Protection Plan as recommended by the Department of Environment and Conservation.

The Panel concludes that with appropriate mitigation the adverse environmental effects of the Project on rare plant species are not likely to be significant.

Given the somewhat limited information available on rare plants in the Labrador region and the resulting uncertainty in the predictions made about the presence of rare plants in the Project area, the accuracy of the prediction made by Nalcor that rare plants would not be significantly impacted would have to be carefully monitored during the reservoir preparation stage if the Project were to proceed.

7.4 WILDLIFE

7.4.1 Nalcor's Views

The EIS assessed effects of the Project on wildlife habitat, health, and mortality for identified key indicator species including moose, black bear, beaver, marten and porcupine. Nalcor also evaluated the effects of the Project on caribou and birds, which are covered in Section 7.5 and 7.6 respectively.

Nalcor chose key indicators based on their sensitivity to Project interactions, their ability to indicate effects on larger components of the environment, their economic, recreational or cultural importance to stakeholders, and population status and vulnerability. Nalcor established the lower Churchill River watershed as the terrestrial assessment area for all terrestrial key indicator species, except caribou (Figure 9).

To determine how the Project would affect habitat for each key indicator species, Nalcor measured either the amount of primary habitat lost, the amount of staging or breeding habitat lost, or the number of breeding sites lost. Nalcor determined that, based on the experience of past developments in Canada, "high" habitat loss was conservatively defined as greater than 25 percent of the habitat in the assessment area, "moderate" between 5 and 25 percent and "low"

anything below this threshold. Nalcor noted that using a habitat-based approach allowed it to determine the effects of the Project on 20 different species without having to count every individual. It stated that this approach provided an accurate prediction of the effects because in circumstances where habitat is present in sufficient quality and abundance, population sustainability would not be affected.

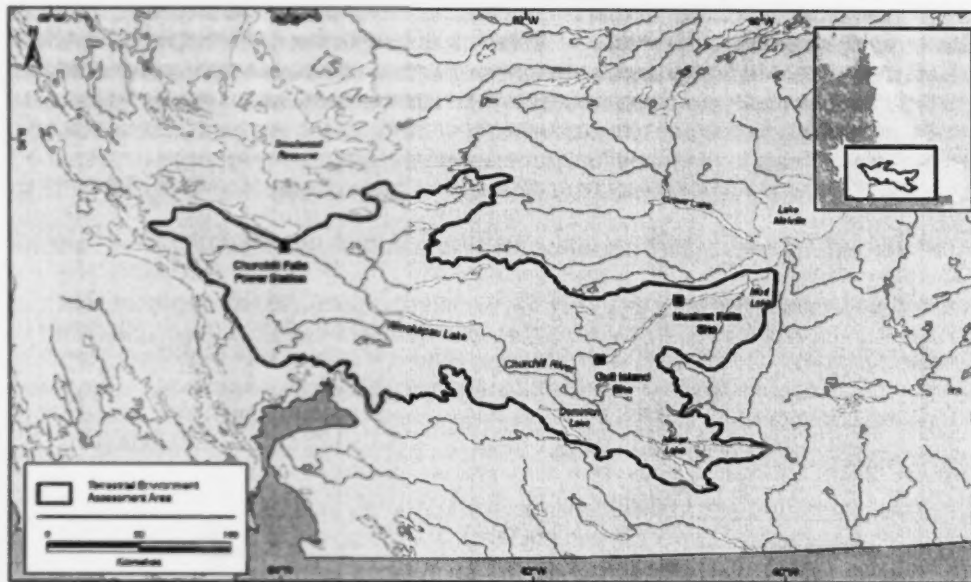


Figure 9. Terrestrial assessment area boundaries (Source: Nalcor)

Nalcor stated that significant adverse effects were not anticipated for most species, however displacement into adjacent habitat could result in increased competition and predation and lower reproductive success. Nalcor explained that most species assessed would have an abundance of adjacent primary habitat available within the river valley and the Project would not have a significant effect at the population level. In addition, Nalcor assessed the ability of the Project area to retain similar levels of biodiversity in the lower Churchill watershed post-construction. Nalcor stated that while the Project would directly affect 16 percent of the lower Churchill River valley, mitigation would help maintain biodiversity and any adverse effects on wildlife, identified in the assessment or through monitoring and follow-up programs would be mitigated.

With regard to species at risk, Nalcor's environmental assessment included all federally SARA-listed species as key indicators. These included the Red Wine Mountains caribou herd, Harlequin Duck, Common Nighthawk, Olive-sided Flycatcher, Gray-cheeked Thrush and Rusty Blackbird. Nalcor pointed out that none of these species have recovery strategies or action plans, with the exception of the Harlequin Duck which has an Eastern Population Management Plan and that no critical habitat has been designated for any of these species. Birds of concern would occur in the assessment area (aside from Harlequin Duck), and would not be restricted to regionally uncommon habitats. Nalcor stated that the percentage of primary habitat within the assessment area that would be lost due to the Project is less than two percent for each of these species. In addition, availability of breeding habitat would not be a threat to the recovery of these species. As a result, Nalcor concluded that the Project is not anticipated to result in

significant adverse effects for any of these species. In summary, Nalcor submits that the Project would not likely result in any significant adverse environmental effect on species at risk.

Nalcor conducted an Ecological Risk Assessment of methylmercury exposure for otter and osprey to predict changes in health. These species were selected as they feed almost exclusively on fish and were considered most at risk. Nalcor collected baseline information to calculate mercury exposure for osprey through feather collection from nests. However, Nalcor used literature threshold values and water and zooplankton mercury measurements to estimate the effects of mercury on otter because it was unable to sample otter directly. Nalcor explained that an Ecological Risk Assessment was not required for other species because even though mercury was found in terrestrial organisms, methylmercury was primarily an aquatic issue. Some studies were cited of songbirds which demonstrated that they had an ability to accumulate small amounts of methylmercury from eating insects, but their concentrations were always lower than the fish-eating species and did not present a concern.

Based on the information collected on osprey, the Ecological Risk Assessment indicated that there would not be any physiological or other effect on fish-eating birds. In response to concerns from Environment Canada that Nalcor should have included exposure to mercury while osprey are on its wintering grounds and consuming food other than fish, Nalcor explained that the conservative hazard quotient threshold of 0.8 did not account for these. However if it had, the calculated hazard quotient would still remain under the standard hazard quotient threshold of 1.0.

Nalcor predicted that there would be potential adverse effects on otter resulting from mercury exposure, but noted the conservative model likely overestimated mercury exposure in this species. As a result, Nalcor concluded that river otter were not expected to experience any population level health effects as a result of the Project. Nalcor committed to gather additional baseline data on osprey and river otter prior to inundation and to monitor mercury exposure in these species following impoundment to ensure that terrestrial wildlife exposure would not produce any adverse health effects.

In addition to the evaluation of methylmercury on wildlife health, Nalcor found that the potential for health-related effects on key indicators was limited to black bear, which may interact with possible contaminants associated with site waste management and camp operations. Proper site management would minimize these effects.

The EIS also described effects on wildlife species due to changes in mortality which could occur through vehicle collisions, drowning during inundation of the reservoirs, or indirectly as a consequence of increased access resulting in hunting and trapping. Nalcor would implement mitigation measures to minimize this risk and anticipated minimal mortality as a result of the Project.

According to Nalcor, the timing of impoundment would help reduce potential wildlife mortality. Nalcor stated that the greatest environmental effects would occur in the spring and summer, while the early fall afforded the least adverse interactions for aquatic and terrestrial species (Table 6). The preferred timing for reservoir impoundment would occur immediately after the construction of the civil works and was expected to occur between August and October. Nalcor stated that should impoundment occur outside this period, it would consult with appropriate regulators in order to mitigate any effects with the change in schedule.

Nalcor concluded that only osprey, wetland sparrow and other bird species of concern would be affected by a change to earlier impoundment timing. These species would be nesting earlier in the summer and there would be a possibility of mortality related to flooding nests. In response to

concerns regarding black bear, Nalcor stated that there was no evidence of bears denning in the Churchill River valley in October and therefore, the August to October impoundment period would not affect them.

Table 6. Timing of impoundment and effects on key indicator species (Source: Nalcor)

Key Indicator Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GR Herd												
RWM Herd												
Moose												
Black Bear												
Beaver												
Marten												
Porcupine												
Canada Goose												
Surf Scoter												
Ruffed Grouse												
Osprey												
Wetland Sparrows												
Harlequin Duck												
Other Species of Concern												

Yellow - presence; Pink - heightened vulnerability; Blue - highest vulnerability

Nalcor proposed various mitigation measures for key indicator species in the event that the timing of impoundment changed:

- monitoring via satellite collars to confirm if present in the area and delaying impoundment until animals have left (e.g. caribou);
- use of an avifauna management plan to address potential interactions with nest disturbance (e.g. birds); and
- relocating individual animals and nests (e.g. herpetiles, beaver and osprey).

As per recommendations from the provincial Department of Environment and Conservation, Nalcor would develop mitigation and monitoring programs for each key indicator species and would use these programs to develop adaptive management procedures.

In response to additional recommendations from the Department of Environment and Conservation regarding monitoring of marten using a rigorous and measurable survey design and protocol involving hair snag mark recapture surveys before, during and after construction, Nalcor stated that there were no clear links to Project effects related to this species.

Nalcor concluded that there would only be a 5.3 square kilometres difference related to transmission right-of-way in the overall amount of terrestrial habitat altered and/or lost between the footprints of the various sequencing options proposed. With respect to changes in habitat within the two reservoirs, there would be no change in amount of primary habitat affected by a change in construction sequence. The potential for direct health-related effects and mortality on key indicators, measures specific to certain key indicators and standard effects management, would remain the same regardless of construction sequence.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to wildlife included the following:

- determine habitat availability and quality outside the Project area for species at risk and the distribution and abundance of species at risk in the Project area;
- develop protocols to mitigate for disturbance and incidental take and outline how construction would minimize these effects;
- reduce wildlife mortality by posting speed limits and implementing a no harassment/no harvesting policy;
- ensure site waste management and relocate nuisance animals;
- reduce habitat loss effects on key indicator species using mitigation measures such as relocating active beaver colonies, replacing osprey nests with artificial platforms, wetland enhancement and creating new hardwood stands;
- relocate active beaver colonies and establish habitat selection criteria for beaver to maximize adult/kit survival for relocated colonies;
- create herpetile habitat in conjunction with rehabilitation of Project facilities such as access roads, borrow pits, quarries, and transmission line routes;
- relocate herpetiles from locations within the reservoirs to locations of suitable existing habitat, such as engineered wetlands, riparian habitat, and decommissioned facility locations;
- conduct summer and winter ground surveys of wildlife habitat association transects established as part of the baseline to examine changes in distribution and abundance for wildlife;
- monitor seasonal changes in habitat distribution for black bears using telemetry;
- monitor beaver in blocks via aerial surveys to examine changes in distribution and monitor effectiveness of the beaver relocation program;
- monitor moose by means of winter aerial surveys and telemetry in key wintering areas and areas where habitat is altered;
- confirm the presence of specific small mammals, spring peeper and salamanders inside and outside the flood zone and in other river systems;
- conduct additional monitoring during construction and operations and develop associated management measures for species where limited information is available, such as woodland jumping mouse, water shrew and pygmy shrew;
- conduct an assessment of trapping data pre- and post-Project;
- monitor methylmercury levels in river otter pre- and post-construction;
- record and report animal mortality related to the Project; and
- carry out monitoring programs for each key indicator species to aid in the development of adaptive management procedures.

7.4.2 Participants' Views

The Nunatsiavut Government stated that with respect to making significance determinations based on remaining quantities of habitat, it was concerned with the use of one terrestrial assessment area boundary for all key indicator species and recommended that the assessment boundary vary as appropriate.

The provincial Department of Environment and Conservation concurred with Nalcor that there were six species in the Churchill River valley that were considered at risk: boreal woodland

caribou, common nighthawk, olive-sided flycatcher, grey-cheeked thrush, rusty blackbird and harlequin duck. It referenced prohibitions under the Provincial *Endangered Species Act*, which stated that these species were to be protected against harassment, disturbance, injuring or killing or destroying and disturbing their residence. The Department raised concerns that the level of risk associated with the environmental effects as stated by Nalcor did not adequately reflect the conservation status of these species.

A number of participants expressed concern about the effect the Project would have on endangered species. Some felt that not enough was known about how the Project would affect the recovery of these species. Environment Canada indicated that the recovery strategies for some federally listed species were not due until after the conclusion of the EA process, and that at least one overdue recovery strategy would not be available for some time. Critical habitat had not been identified for many of the federally listed species. Environment Canada indicated that considering that habitat availability was not recognized as a limiting factor for any of the federally listed species, and given the relatively small loss of habitat involved relative to the greater ecosystem, it did not believe that the Project would have a population-level effect for any species at risk.

With respect to furbearer species, small game, and large game, the Department of Environment and Conservation was not concerned about persistence at the population level for any species noted in the EIS. However, it noted that localized impact on these groups would range from mortality to habitat loss and displacement and that the implications of displacement and the subsequent effects on competition and reproductive success were not appropriately measured. Baseline studies were recommended to address information gaps in the assessment, and monitoring was suggested to identify and implement adaptive management measures.

The Department of Environment and Conservation recommended the development of an Environmental Protection Plan for wildlife species and encouraged consultation with the Department on mitigation measures. In addition, it recommended additional monitoring and management measures for those species that may be found in the Project area, such as woodland jumping mouse and spring peeper, where limited information is available. It agreed with the proposed measures that had been highlighted for osprey and herpetiles. In addition, the Department suggested that Nalcor conduct a study on herpetile abundance and distribution, marten hair snag surveys and wolf collaring. In particular, activities that could impact listed species in any way should be conducted so as to limit Project effects to the extent possible.

Many participants stated that they were concerned about how the loss of the flooded area would affect wildlife. They stated that flooding would result in irreversible changes to the ecosystem. Participants expressed concerns regarding the direct influence of flooding on animal mortality and indirect effects of flooding on animal habitat and diet. The Natural History Society stated that beavers and some shoreline nesting birds would be negatively affected by the fluctuation of water levels and slumping riverbanks. Another participant also indicated that animals downstream of the development would experience adverse effects and that these had not been considered by Nalcor.

Some participants cited negative experiences from the development of the Churchill Falls project. Several participants noted that prior to this development, wildlife such as partridge, porcupine, eagles, herpetiles and Canada geese were abundant in the area. One participant stated that animal mortality and disturbance occurred during the construction of the Churchill Falls project and expressed concerns that the Lower Churchill Project would have similar effects.

Several participants indicated that herpetiles would be affected by the Project. One participant in particular expressed concerns that frogs in Mud Lake would be influenced by potential saltwater intrusion. In addition, some participants in North West River noted that flooding could release clay sediment, which would affect the food sources and spawning grounds of bottom-feeding animals.

According to Innu Nation Elders, the wasting of wildlife was considered a significant effect regardless if animals were only displaced or if mitigation measures were proposed. The Nunatsiavut Government also disagreed with Nalcor's assertions that there would be no significant effects. Inuit participants stated the importance of the interconnected ecosystem and indicated that all animals played a role in the health of this ecosystem. They also stated that Inuit have extensive traditional knowledge of aquatic and terrestrial ecosystems and would be in the best position to document changes to these systems.

7.4.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on wildlife, the Panel considered the following factors to be particularly relevant:

- the key indicator approach taken by Nalcor in its EIS;
- the presence of a number of species at risk in the Project area, including the boreal woodland caribou (Red Wine Mountain caribou herd), the common nighthawk, the olive-sided flycatcher, the gray-cheeked thrush, the rusty blackbird, and the harlequin duck;
- the presence of other species of concern identified by the Department of Environment and Conservation, including raptors, amphibians, and small mammals; and
- the presence of a number of migratory birds in the Project area, particularly during the spring and summer months.

Given the high percentage of Aboriginal participants in communities potentially affected by the Project, it is not surprising that the Panel heard many concerns about the possible adverse effect of the Project on various plants and animal species of social and cultural significance to Aboriginal people. Similarly, non-Aboriginal residents of Labrador continue to rely on country food to a large extent. More discussion related to the effect of the Project on medicinal plants and country food is found in Chapters 9 and 13.

The timing for impoundment has implications for both the terrestrial and the aquatic environment. As discussed in Chapter 6, the Panel has concluded that there is only a limited season during which the impacts of impoundment are manageable from both a terrestrial and an aquatic perspective. Terrestrial impacts include effects on bears, osprey, and migratory birds among others. These impacts would be significant, and no adequate mitigation measures were identified. Given this conclusion and Recommendation 6.1 – timing of impoundment, adverse terrestrial effects of impoundment at other times of the year are not further considered.

The Panel concludes that with appropriate scheduling of impoundment as recommended in Chapter 6, the impoundment process is not likely to have a significant impact on terrestrial species.

The Project's potential effect on listed endangered species, including the boreal woodland caribou (Red Wine Mountain caribou herd), the common nighthawk, the olive-sided flycatcher, the gray-cheeked thrush, the rusty blackbird, and the harlequin duck is of particular concern to the Panel. For listed species, access to recovery strategies that include the identification of

critical habitat will be critical for government decision makers to be in a position to properly evaluate the potential risk the Project poses to the recovery of listed species. Without the recovery strategies and critical habitat, decision makers will not be in a position to fully appreciate the Project's impact on the most vulnerable species.

To illustrate, the Panel learned during the course of the environmental assessment of the Project about the primary Red Wine Mountain caribou herd habitat that would be flooded. The Panel notes that the area to be flooded is significant, however, the percentage of primary habitat is modest. The Panel was provided with a recovery strategy for the Red Wine Mountain caribou herd; however, the strategy fails to identify critical habitat for its recovery. Without knowing whether the primary habitat to be flooded is critical habitat for the recovery of the Red Wine Mountain herd, it is more difficult for the Panel to assess the impact of the Project on the prospect for recovery of the herd.

It clearly would have been desirable for all recovery strategies and critical habitat identification to have been completed before the start of the hearing, regardless of when they are required under federal or provincial legislation. Unfortunately, this did not happen. Only the recovery strategies for the harlequin duck and the Red Wine Mountain caribou herd were provided to the Panel. A number of the strategies, including those for the common nighthawk, olive sided flycatcher and rusty blackbird, are not required to be completed until after the conclusion of this environmental assessment. The absence of these recovery strategies makes it more difficult for the Panel to assess the impact of the Project on the recovery of these listed species.

What is particularly troubling to the Panel is that in some cases, recovery strategies and critical habitat identification appear to have been required to be completed under legislation before the hearings but were not available to the Panel. The recovery strategy for boreal woodland caribou, according to Environment Canada, was legally required by 2007, but was not expected until June 2011. The completion of recovery strategies and the identification of critical habitat are government responsibilities. They are not the responsibility of Nalcor.

The Panel concludes that based on the information available the Project is not expected to have a significant impact on listed species other than the Red Wine Mountain caribou herd; however the lack of recovery strategies and identification of critical habitat for some of these species make a final significance determination premature.

RECOMMENDATION 7.3 Recovery strategies for endangered species

The Panel recommends that, if the Project is approved, federal and provincial governments make all reasonable efforts to ensure that recovery strategies are in place and critical habitat is identified for each listed species found in the assessment area before a final decision is made about the effects of the Project on those species. Compliance with federal and provincial species protection legislation should be seen as a minimum standard. In fairness to Nalcor, this work should be given the priority needed to ensure that the Project decision is not unduly delayed. A final Project decision should only be made once government decisionmakers are satisfied that the recovery of listed species would not be compromised by the Project. Where Environment Canada is relying on provincial efforts to fulfill its obligations under the safety net provisions of the federal *Species at Risk Act*, before a federal decision is made about the Project it should satisfy itself that the provincial efforts for any species at risk are sufficient for its recovery and will not be compromised by the Project.

RECOMMENDATION 7.4 Compliance with species at risk legislation

The Panel recommends that, if the Project is approved, Nalcor should work with federal and provincial departments responsible for species at risk legislation to ensure all Project-related activities comply with restrictions and prohibitions against harassment, disturbance, injuring or killing of listed species or destroying and disturbing their residence.

Should it not be possible to complete recovery strategies and identify critical habitat not required by law before making a project decision, decision-makers should take a precautionary approach. This means decision-makers should err on the side of overestimating the Project's impact on listed species and should assume, unless there is clear evidence to the contrary, that the assessment area includes critical habitat and is otherwise essential to the recovery of the species.

7.5 CARIBOU**7.5.1 Nalcor's Views**

The EIS also assessed effects of the Project on habitat, health, and mortality for the Red Wine Mountain caribou herd and the George River caribou herd. The Red Wine Mountain caribou herd is considered threatened under the provincial *Endangered Species Act* and the Canadian *Species at Risk Act*. The George River caribou herd is in decline but not considered threatened and hunting is legal within permitted seasons. The Lac Joseph caribou herd was also known to occur in the Project area; however, Nalcor did not include this herd in its assessment.

The Red Wine Mountain caribou herd was selected as a key indicator due to its small size, sedentary nature and limited range, factors which made it particularly vulnerable to Project effects. The George River herd was noted as having seasonal overlap with the Project area during the winter months. Nalcor considered the possibility of Project effects on the Lac Joseph caribou herd in response to an information request from the Panel but stated that it had limited spatial overlap at the northern extent of its range and therefore was not expected to be affected by the Project. The respective ranges of the caribou herds in relation to the Project area are provided in Figure 10.

In its assessment, Nalcor used the Red Wine Mountain caribou herd range as the caribou assessment area, which is approximately 57,000 square kilometres. Nalcor acknowledged that the range of the migratory George River caribou herd covers most of the Ungava Peninsula, but that a portion of its annual movements overlaps with the Project and would be captured within the caribou assessment area (Figure 11).

To carry out the habitat modelling for the Red Wine Mountain caribou herd, Nalcor used Forest Management District 19 as its study area. This area represents approximately 30 percent of the recent range of the Red Wine Mountain caribou herd. Nalcor explained its choice of study area noting that detailed habitat data were not available for the rest of the herd's range. Nalcor stated that the absence of sufficient habitat data for the remainder of the range would not affect its modelling predictions as the effects of the Project did not extend beyond the forest inventory area. After habitat types were determined, Nalcor used telemetry data to understand caribou use of the assessment area.

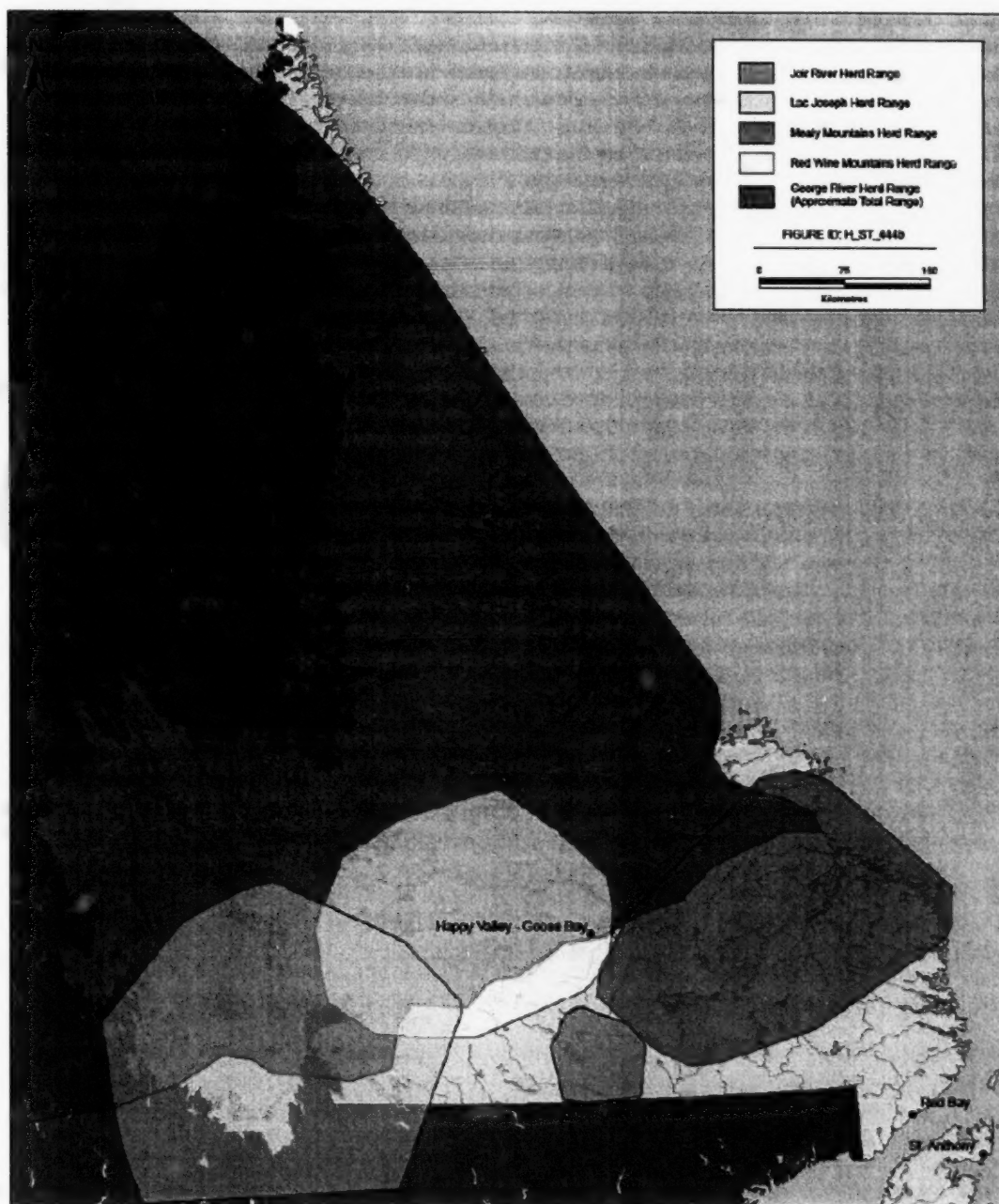


FIGURE 1

Caribou Distribution in Labrador

Figure 10. Caribou distribution in Labrador (Source: Nalcor)

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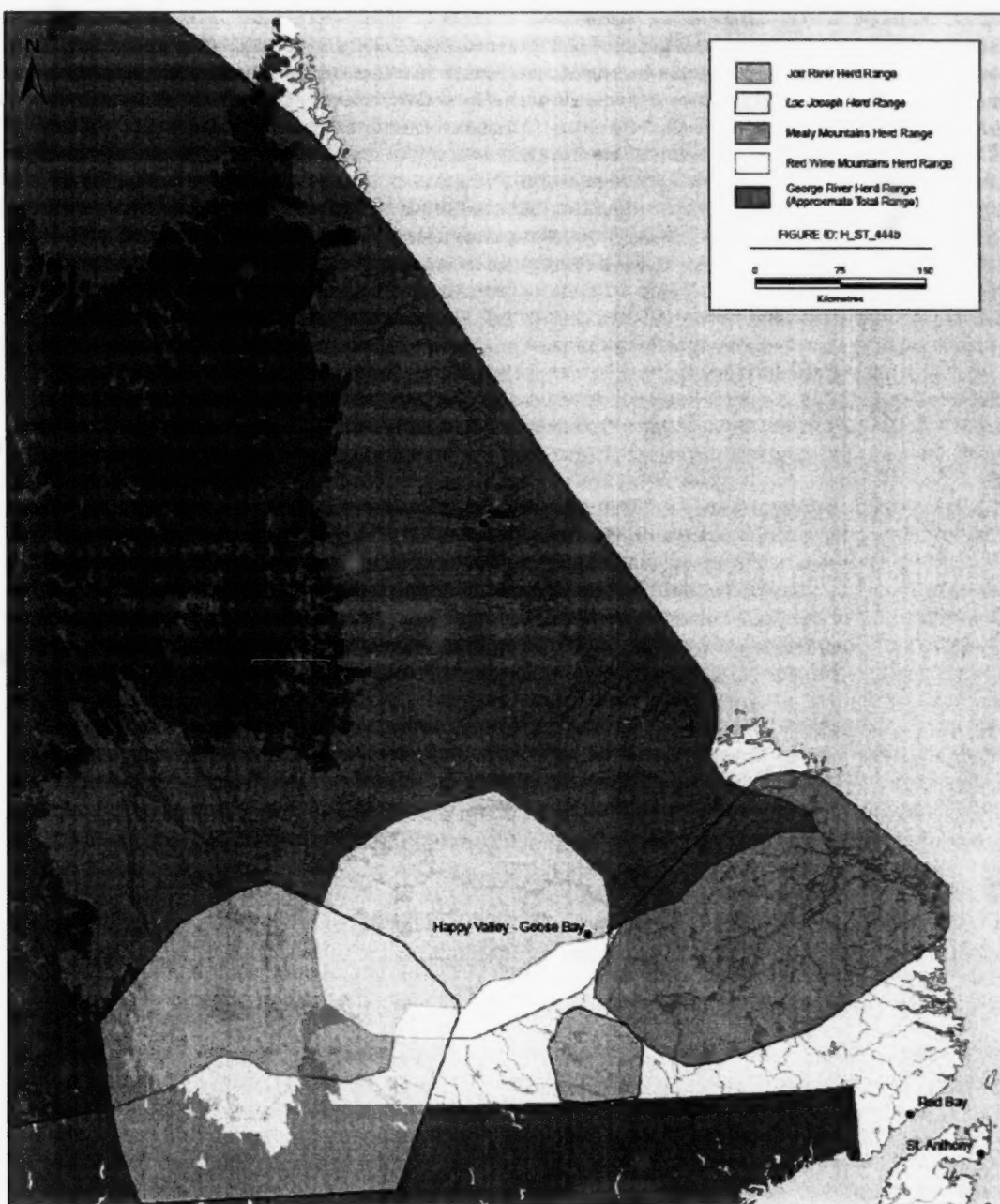


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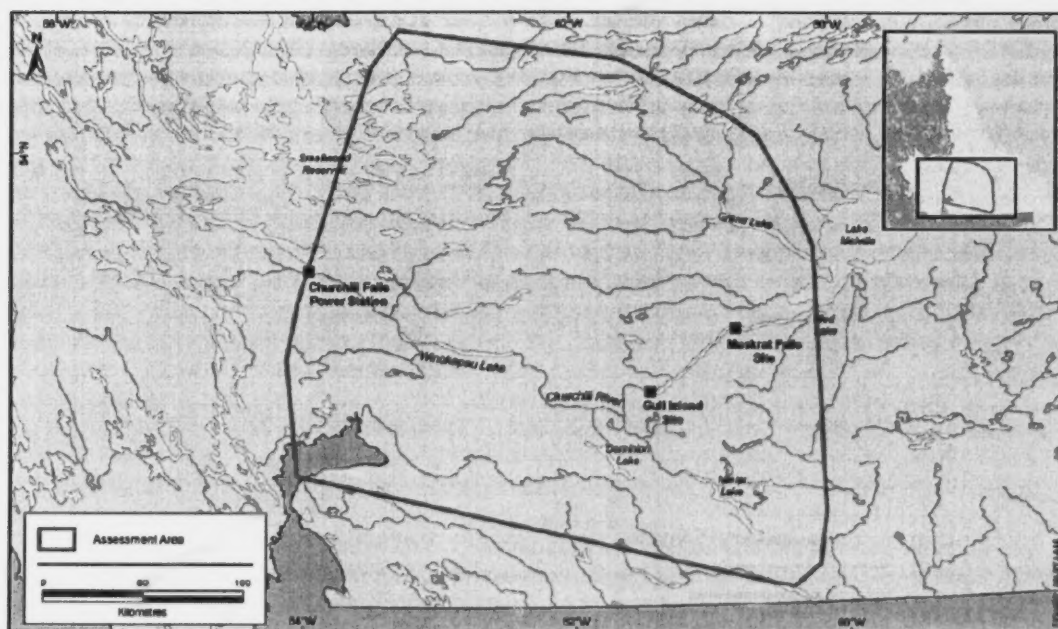


Figure 11. Caribou assessment area boundaries (Source Nalcor)

Nalcor used a habitat suitability model termed a Resource Selection Function that estimated the amount and distribution of preferred habitat types based on landscape variables. Nalcor considered this to be the most suitable model to use when abundant data were available. The habitat suitability model predicted that, depending on the season, 91 to 99 percent of the area that would be inundated was not primary caribou habitat and mainly comprised riparian ecosystems that were not important for caribou. During construction, Nalcor predicted a loss of five percent of primary habitat during the calving season, a one percent loss in the post-calving, and a 12 percent loss in winter. Nalcor stated that once effects of construction subside, the physical loss of habitat and any short-term disturbances during operations would be less than a one percent change from baseline in all seasons. Because the amount of primary habitat after inundation would be similar to existing conditions, Nalcor predicted that regional movements would also be maintained.

Taking into account of participant comments received during the EIS review period, Nalcor re-created the habitat suitability model but noted that suggested patterns remain as stated in the EIS. Nalcor disagreed with participants in the public hearing who stated that it was actually 30 percent of the primary habitat in the winter range that was affected by the Project, stating that this was calculated incorrectly by using values from the re-created model and the original model interchangeably.

Nalcor stated that while some habitat would be lost, the limiting factors for this herd have been identified as hunting and predation, not habitat. Nalcor, therefore, designed the Project to limit additional access for both humans and predators. In response to participant concerns regarding predator-prey relationships, Nalcor predicted that the Project would not result in increased moose density or predation pressures. The Project would flood moose habitat in the river valley which would encourage displaced moose to move to other river valleys and not to the plateau where caribou are found. Therefore, wolves would not be attracted to the upland areas and

predation on caribou living in these areas would not increase. In an effort to reduce moose habitat upland, Nalcor proposed to use high density planting of conifers to rehabilitate access roads.

Over time, the abundance of caribou has risen and fallen. While reasons for this are unclear Nalcor maintained it was a natural process. Nalcor stated that the overall fate of the Red Wine Mountain caribou herd was likely one of continued decline even without the Project. Project-related effects (primarily associated with habitat alteration or loss) would not result in the herd's decline. Nalcor concluded that there would not be significant effects on the Red Wine Mountain caribou herd because:

- the total disturbance effects on this herd from the Project would remain well below the threshold that would trigger population effects on caribou;
- greater than 90 percent of the area to be inundated was poor caribou habitat; and
- alternate habitat was available outside the study area.

Nalcor stated that the Project was located at the periphery of the George River caribou range and there was a small degree of overlap with the Lac Joseph caribou herd. Nalcor predicted that similar effects would apply to these herds but noted that they would occur on a smaller scale due to the limited overlap with the Project and, in the case of the George River herd, would therefore not affect migration patterns.

Nalcor proposed mitigation measures that would be applicable to any caribou herd in the Project area. These included controlling permanent access roads; restricting access to the Project area; implementing a no-harvesting policy; designing work schedules to minimize travel in designated areas during calving and post-calving periods and removing trees from the riparian zone surrounding the reservoirs to provide unimpeded access for wildlife.

According to Nalcor, other influences such as mortality or health effects were not determined to have a significant effect. Nalcor cited concerns regarding indirect effects resulting from increased access and hunting on the caribou herds and committed to decommission all roads in the Project area except for 15 to 30 kilometres of permanent access roads. Decommissioned roads would be between 8 and 15 metres in width, and permanent access roads 9 metres in width. Neither would influence caribou movement.

Nalcor stated that it was committed to minimizing the effect of the Project on caribou and other wildlife species and was committed to monitoring the caribou and moose populations to validate predictions. However, in response to recommendations made by the provincial Department of Environment and Conservation, Nalcor stated that it would not collar wolves because that was beyond the scope of effects monitoring, that additional research including the identification of critical habitat was the responsibility of the Woodland Caribou Recovery Team, and that it would not conduct activity sensing or aerial monitoring for caribou.

With construction of the Project beginning at Muskrat Falls, with or without an overlap in construction of the facilities, a delay in the interaction with the occasional winter movements of the George River caribou herd was expected although the effects would remain the same as noted in the EIS. Similarly, a deferred effect on mortality would be experienced. The delay would be correlated with the delay in construction. However, Nalcor stated that there would be no difference in potential health effects with a change in construction sequence.

For the Red Wine Mountain caribou herd, no change in effects would be expected with a change in construction sequence, as the spatial footprint of the Project would be the same in any scenario.

Nalcor concluded that there would be a significant cumulative effect on the Red Wine Mountain caribou herd without the Project. It was noted that the herd is currently experiencing, without the Project, significant cumulative effects due primarily to predation and illegal hunting. However, as the Project would not contribute to the cumulative effects and could result in only a small percentage of primary habitat loss, the effect of the Project was deemed to be not significant. Nalcor stated that it would consider cumulative effects in its mitigation measures for the herd.

In response to concerns that Nalcor did not include the effects of the transmission line in the assessment, Nalcor stated that the construction of the transmission line was included in the cumulative effects assessment, however, it was assessed in less detail than the rest of the Project. Nalcor stated that little primary caribou habitat would be affected and effects would be mitigated by following the existing right-of-way and other linear features where possible.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to caribou included the following:

- consider timing of construction and other activities and restricting access when caribou are in the area;
- reduce wildlife mortality by posting speed limits and implementing a no harassment/no harvesting policy;
- arrange work schedules to minimize travel in designated areas during calving and post-calving periods;
- remove trees from the riparian zone surrounding the reservoirs;
- monitor both the Red Wine Mountain and George River herds to ensure that predictions of Project effects are accurate including evaluating effects of habitat loss and alteration, increased access and changes in predator-prey dynamics;
- design monitoring and follow-up programs to allow for the identification of cumulative effects by referencing applicable management plans and consulting with regulators;
- monitor daily and seasonal road and river crossings by caribou and traffic access;
- provide support for telemetry work to monitor caribou population numbers, calf survival, and movement and distribution patterns;
- monitor the Red Wine Mountain caribou herd through ongoing participation with the Labrador Woodland Caribou Recovery Team, including support of satellite GPS monitoring and other work directly related to the effects of the Project; and
- monitor the George River caribou herd through participation with the George River Caribou Herd Co-Management Team.

7.5.2 Participants' Views

Many participants disagreed with Nalcor's conclusion that the effects of the Project on caribou herds in the area would not be significant. Participants cited evidence that the Churchill Falls project changed the migratory patterns of caribou and were concerned that this effect would occur again with the Project. Participants stated concerns that the significance assessment did not take into account the small population size of the Red Wine Mountain caribou herd.

The provincial Department of Environment and Conservation and Innu Nation agreed with Nalcor that wolf predation was known to be one of the main limiting factors of the Red Wine Mountain caribou herd. However, they stated that developments such as the Project could influence predator-prey dynamics. One participant noted that reservoir clearing would promote the growth of new moose habitat which would have an adverse effect on caribou. He suggested

that reducing the number of moose in the area through hunting may be an appropriate mitigation measure to avoid an increase in caribou predation by wolves. Another participant stated that the Project was not likely to cause an increase in the moose population upland, as this was not suitable habitat for moose. Therefore, he concluded that an increase in wolf density and subsequent predation on caribou was not a likely effect of the Project.

Several participants did not agree that wolves were the main limiting factor of the caribou herds. However, participants acknowledged that hunting did have an impact on the Red Wine Mountain herd's decline. Innu Nation stated that managing human interactions with caribou was a good starting point in re-establishing the species. It stated that because the Red Wine Mountain caribou herd was utilizing the southern portion of the range more frequently and intermixing with the George River caribou herd, that hunting of these individuals happened accidentally. As a result, Innu Nation has mandated that hunting of the George River caribou herd by its members occur only outside the possible range of the Red Wine Mountain caribou herd.

The Council of the Innu of Unamen Shipu contended that the lack of existing information regarding caribou mortality sources in Labrador made Nalcor incapable of determining what effects the Project, should it proceed, may have on caribou. The steps outlined in the *Recovery Strategy for Three Woodland Caribou Herds (Rangifer tarandus caribou; Boreal population) in Labrador* developed by the Government of Newfoundland and Labrador and used to gain a better understanding of the relative importance of real and potential sources of caribou mortality in Labrador were considered unsatisfactory and inadequate by the Council of the Innu of Unamen Shipu.

The Council of the Innu of Unamen Shipu noted that the factors that limited caribou abundance were not independent of each other. It cited studies that showed that loss of habitat and increased access from development projects had an effect on caribou mainly in the form of increased access for hunting and predation along corridors. Many Aboriginal groups expressed concerns that caribou were sensitive to disturbance and would not return to the area after construction of the Project. The Council of the Innu of Unamen Shipu indicated that disturbance effects could result in an important loss of food for the Innu in Labrador and Quebec.

Several participants agreed that Nalcor had provided a good overview of caribou populations in the area but with respect to effects on caribou outside the Project footprint, Nalcor had not comprehensively assessed direct effects, including habitat loss and alteration, and indirect effects, including the influence of roads, increased access resulting in increased hunting and changes to predator-prey dynamics. Participants asserted that direct impacts from the Project would not affect the caribou herds as much as indirect effects. The Department of Environment and Conservation and Innu Nation concurred that indirect effects were the largest problem with developments.

The provincial Department of Environment and Conservation and Innu Nation also noted the importance of understanding woodland caribou habitat preferences and evaluating the effects at the range-wide level. They stated that the habitat analysis conducted by Nalcor for the Project was inadequate. The Department of Environment and Conservation noted that the habitat information used by Nalcor only covered 30 percent of the Red Wine Mountain caribou herd's range and the forest inventory data that was used did not include lichen covered areas or wetlands which the Red Wine Mountain caribou herd uses for calving. In addition, the Department asserted that the information in the assessment area was not representative of the full-range of ecological communities that a caribou would experience and that this, combined with the quality of habitat data, made it impossible to extrapolate the effects across the entire

assessment area. As a more general flaw, Innu Nation stated that habitat did not necessarily correspond to reproductive success and might not be a good indicator of population sustainability. Innu Nation also pointed out that an assessment of the effects of the Project on caribou should not focus solely on habitat as it was also concerned that increased access would have a negative impact on caribou populations in the area.

The Panel was informed that a recovery strategy had been established by the Province for the Red Wine Mountain caribou herd, but that critical habitat had not yet been identified. However, it was still able to comment on habitat preferences of caribou. The Department explained that caribou show little preference for secondary and tertiary habitat and therefore the focus of the significance determination should be on the loss of primary habitat. It stated there was uncertainty around the insignificance of effects of the Project on the Red Wine Mountain caribou herd as stated by Nalcor because caribou have specific habitat requirements in the winter, because the Project will affect 30 percent of the winter habitat in the Assessment area, and because there is a limited understanding of how caribou perceive linear disturbances that might affect their movements. Both Innu Nation and the Department concluded that the effects of the Project on the Red Wine Mountain caribou herd could be adverse and significant.

Innu Nation expressed concerns that the George River caribou herd had not received adequate attention in the assessment and could potentially be affected by the Project because of its current decline and heavy reliance on winter habitat. The Department of Environment and Conservation noted that animals in the George River herd gain weight in the winter, suggesting that their summer habitat is poor. It was noted that the recent southward drift of the George River caribou range would increase contact with the Project area and caribou movement across the Churchill River would be affected by the cleared area on either side of the valley.

The Council of the Innu of Ekuanitshit expressed concern to the Panel that by not including the Lac Joseph herd in its assessment Nalcor did not fulfill its obligations. Naskapi Nation of Kawawachikamach stated that the Lac Joseph herd congregates in the Project area, would also be affected by the Project, and noted that it needed protection from the pressures that have been placed on the George River herd.

Many participants stated that more field work would be required to inform decision-makers about the population dynamics of the caribou in the region and the reasons behind the decline. Participants asserted that this additional research, including the identification of high value habitat, additional wolf collars and activity sensing and aerial monitoring of caribou would be required in order to implement effective mitigation.

Innu Nation expressed concerns that Nalcor had not paid proper attention to Project effects on caribou herds when designing mitigation. It noted that Elders felt that the Project would have a major effect on caribou, which included a moral and value component and community values which were not taken into consideration. Innu Nation also concluded that mitigations proposed by Nalcor were minimal. It recommended that mitigation measures be structured in a way that removed residual effects. The Department of Environment and Conservation and Innu Nation recommended that an Environmental Protection Plan be developed, that the timing of construction activities be scheduled to minimize effects during sensitive periods, and that Nalcor reduce and consolidate disturbance as much as possible. These participants also stated that decommissioning roads would not facilitate the crossing of linear corridors and that Nalcor should attempt to identify areas where access could be adjusted or disturbance could be reduced to promote crossings. Other mitigation measures were suggested such as collaborative work with the Province to create a base map of ecological communities relevant to caribou, and biodiversity offsets such as protecting other parts of the caribou herds' ranges.

Innu Nation cited concerns that the Project would invite new activity in the area and cumulative effects on caribou would be compounded. It stated that these forms of landscape changes could have a major impact on caribou populations through both direct and indirect effects. Innu Nation also noted that the Province intervened in the Romaine Hydroelectric Complex project due to the potential effects on caribou. However, Nalcor had not included this project in its cumulative effects assessment.

Innu communities in Quebec noted that there were cumulative effects on the George River herd including the Churchill Falls project, mining projects, railway projects and transmission lines. They predicted that the Project would impact them further.

7.5.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on caribou, the Panel considered the following factors to be particularly relevant:

- the presence of the endangered boreal woodland caribou (Red Wine Mountain caribou herd) in the Project area;
- the cumulative impact of a range of past and present human activities on the Red Wine Mountain caribou herd;
- the presence of other caribou herds of particular importance to local Aboriginal and non-Aboriginal residents, particularly the George River caribou herd; and
- the large range of the George River caribou herd, other developments in that range, including the Romaine Hydroelectric Complex project, and the limited area included in Nalcor's cumulative effects assessment for the herd.

The Panel concludes that the recovery of the Red Wine Mountain caribou herd is very much in doubt with or without the Project. Most participants agreed with Nalcor's assessment that human hunting and predation are the major contributors to the current plight of the herd, and will continue to be significant threats to its survival. The Panel noted the commitment by Innu Nation to stop the hunt of caribou within the known range of the Red Wine Mountain caribou herd.

Beyond the threat of human hunting, there is uncertainty and some level of disagreement over the significance of other contributing factors, such as the Trans Labrador Highway, habitat fragmentation, and climate change, among others. The status of the provincial recovery strategy, and particularly its failure to identify the location of critical habitat, adds to the uncertainty surrounding the possible scale of the impact of the Project on the Red Wine Mountain caribou herd.

Based on the imperiled status of the Red Wine Mountain caribou herd and the uncertainty and disagreement over the range of factors that might be important for its recovery, the Panel concludes that any adverse effects of the Project on individual animals within the Red Wine Mountain caribou herd would be significant. Nalcor correctly pointed out that there is sufficient primary habitat outside the area directly affected by the Project. It is nevertheless clear that the Project, if it were to proceed, would pose a variety of risks to members of the herd, including possible displacement, possible increase in animal predation resulting from changes in the predator-prey dynamics and possible road kills from increased traffic, among others.

The Panel concludes that in light of the current state of the herd and the cumulative effects on its recovery, the Project would cause a significant adverse environmental effect on the Red Wine Mountain caribou herd.

RECOMMENDATION 7.5 Road construction and decommissioning

The Panel recommends that, if the Project is approved, the provincial Department of Natural Resources require Nalcor to minimize road construction outside the reservoirs, by locating new roads inside the impoundment area as much as possible. Any new roads proposed by Nalcor to be located outside the impoundment areas should be carefully reviewed by the Forestry Branch of the Department of Natural Resources and only approved if there is no reasonable alternative. In order to ensure that conservation objectives are met, all temporary roads outside the reservoir should be decommissioned as soon as possible to the satisfaction of the provincial Department of Environment and Conservation.

RECOMMENDATION 7.6 Recovery of the Red Wine Mountain caribou herd

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation ensure that adequate resources are available so that all reasonable efforts to ensure the recovery of the Red Wine Mountain caribou herd are taken. In addition, the Department should require Nalcor to play an enhanced role in the recovery process for the Red Wine Mountain caribou herd by putting resources into the process for research and recovery efforts and to participate actively in the overall effort to ensure the recovery of the caribou herd.

Concerns about the recent decline of the George River caribou herd were raised at the hearing. Information about the decline only became available a few months before the hearing. As a result, other than a general indication that the decline is still within the historical fluctuation of the herd, limited information was available about the possible causes of the decline or the cumulative effects of the Project with other past, current or future projects on the herd. Clearly, there are many individual impacts on the herd throughout its vast range. Some concerns were raised about the different management approaches in the provinces of Quebec and Newfoundland and Labrador. The Panel furthermore notes that a previous Panel considering the Voisey's Bay Nickel Mine Project, had recommended that any further development consider the cumulative impact of development on the George River caribou herd, including the impact of habitat fragmentation.

The Panel concludes that the effect of the Project on the George River caribou herd in isolation is not likely to be significant. The Panel is not in a position to make a cumulative significance determination because a proper cumulative effects assessment for the George River herd was not carried out and information on the recent decline came too late in the process to allow for proper consideration of its implications for this environmental assessment.

RECOMMENDATION 7.7 Management of the George River caribou herd

The Panel recommends that, if the Project is approved, the provinces of Quebec and Newfoundland and Labrador, Environment Canada and all interested Aboriginal communities initiate a dedicated range-wide joint management program for the George River caribou herd, and through this program cooperatively carry out a comprehensive cumulative effects assessment of the impact of human activities on the herd to be updated periodically as required.

7.6 BIRDS

7.6.1 Nalcor's Views

The EIS assessed effects of the Project on wildlife habitat, health, and mortality for identified key indicator bird species including Canada goose, surf scoter, osprey, ruffed grouse, wetland sparrows, harlequin duck and other species of concern such as the rusty blackbird, grey-cheeked thrush, olive-sided flycatcher and the common nighthawk. The assessment area used for evaluating effects on birds is the terrestrial assessment area described in Section 7.4.

Nalcor stated that the Churchill River was relatively unproductive for waterfowl because of the sandy shores, with the exception of some wetlands adjacent to the river. For most key indicator species, the impounded area represented mostly secondary habitat. The exceptions were surf scoter, osprey, wetland sparrow, harlequin duck and several other bird species of concern. However Nalcor maintained that adequate habitat was available outside the impoundment area and no significant effects were anticipated. Nalcor maintained that the riparian habitat created post-Project would have a structure that would be attractive for most riparian wildlife species but that other wetlands in the area would fill in any functionality missing from the newly created areas.

Nalcor identified ashkui as important habitats for migratory birds such as Canada goose, harlequin duck and possibly surf scoter. Nalcor described ashkui as areas of open water on the lower Churchill River that would remain as open water permanently or would be ice-free early in the spring. Nalcor explained that because these localized areas consisted of open water habitat early in the year, they provided critical productive staging habitats and they tended to be used in high concentrations by waterfowl.

Nalcor described temperature, depth and water velocity as important features for ashkui formation. Nalcor confirmed the Project would likely result in loss of some ashkui on the main stem of the lower Churchill River, however, it expressed confidence that ashkui would persist in adjusted confluence locations after inundation and Project activities would indirectly enhance ashkui productivity (i.e. some of the deltas would be areas of habitat enhancement). Based on its detailed modelling, Nalcor predicted that ashkui would continue to form at higher elevations in tributaries due to the increased velocity of flow and higher temperature of water compared to elsewhere in the reservoirs.

Nalcor, therefore, did not contemplate the necessity for mitigation. Nevertheless, it committed to include site preparation work at the location of future ashkui. Nalcor also mentioned that mitigation measures to enhance fish habitat would also contribute to ashkui formation at selected deltas in addition to ashkui continuing to form outside the Project area. Nalcor also proposed adjusting water depths at the confluence sites through landscaping and committed to develop a follow-up program to confirm the extent and location of ashkui formation.

Nalcor completed aerial surveys and incorporated the best available information about how surf scoters use the lower Churchill River and similar staging areas, and concluded that the Project would not have a significant effect on that species. Nalcor explained that there were limited data on how long waterfowl, in particular scoters, use ashkui in the area as stopover sites. When asked if scoter return to the same sites each year, Nalcor responded that scoter have evolved to be flexible in an environment where not every spring is the same. Nalcor committed to carrying out further behavioural and spatial/temporal studies on surf scoters at ashkui or other areas of open water in the Project area prior to inundation. It did not anticipate that these studies would

change the effects predictions but they would inform mitigation and follow-up programs for surf scoter.

Nalcor stated that harlequin ducks depend on riverine habitat for nesting but all known breeding sites in the area are on tributaries above the projected level of the reservoirs. Harlequin ducks also rely on ashkui for staging in early spring and the conversion of riverine habitat to reservoirs could lower the habitat suitability during staging. Nalcor concluded that harlequin duck would be able to adapt relatively easily to changes in the hydrology of the lower Churchill River, would continue to use available ashkui sites and any effects would not be significant. Effects management for harlequin duck would be achieved through standard mitigation in an Environmental Protection Plan and through the use of best practices informed by the federal Eastern Management Plan for the Harlequin Duck. Examples include the prohibition of hunting by Project personnel, temporal and spatial avoidance of sensitive habitat, proper handling of fuel to avoid spills and a buffer no clearing zone in areas adjacent to breeding habitat. In addition, Nalcor would design an avifauna management plan to reduce the possibility of loss or disturbance to active nest sites.

Wetland sparrows represented the only key indicator for which Nalcor described habitat loss as "high" magnitude. Nalcor described them as habitat specialists and noted that they required wetland and riparian habitat with a variety of shrubs, forbs and emergent vegetation. Since the Project would result in an approximate 60 percent reduction in riparian marsh habitat, it would have an effect on birds that are highly dependent on this habitat found primarily along the lower Churchill River valley shoreline. Inundation was stated to lead to the displacement of the existing populations and a reduction in abundance. However, Nalcor stated that there would be alternative habitat available and new wetland habitat would be artificially created along the riparian fringe of the new reservoirs or along tributary streams and watercourses adjacent to the reservoir. Nalcor predicted that the wetland sparrow population would remain sustainable.

In response to Environment Canada's statement that in order to comply with the *Migratory Birds Convention Act* clearing and grading must be avoided between May 1 and July 31 to minimize impacts on nesting birds, Nalcor stated that it intended to implement an avifauna management plan. As one measure, ornithologists would identify nesting sites in advance and relocate them. Nalcor stated that it would not violate the *Migratory Birds Convention Act* and the creation of an avifauna management plan would ensure this.

In response to the provincial Department of Environment and Conservation suggestions, Nalcor agreed to monitor specific large raptors only and stated that because ptarmigan was a seasonal bird, ruffed grouse would be more suitable for monitoring Project effects.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to birds included the following:

- develop an avifauna management plan with Environment Canada for all species;
- replace osprey nests with artificial platforms;
- follow best management practices and demonstrate due diligence to avoid incidental take of breeding migratory birds and avian species at risk;
- mitigate effects on harlequin duck through standard measures to be included in Environmental Protection Plans and by the use of best management techniques prescribed in Environment Canada's Harlequin Duck Eastern Population Management Plan;
- monitor deciduous habitat creation efforts to evaluate success and use of such sites by ruffed grouse;

- conduct aerial surveys of the lower Churchill River and surrounding locations to verify ashkui formation post-inundation;
- collect additional baseline data on osprey and otter mercury levels to evaluate impacts post-inundation and evaluate mercury levels before and after Project construction;
- conduct surveys for active osprey nests (and other raptors) within 800 metres of the proposed construction zone and monitor any relocated nests;
- undertake pre-construction studies on the use of the lower Churchill River as staging habitat for late nesting waterfowl;
- undertake an additional year of field studies on abundance and distribution of surf scoter and a behavioural study to determine the extent of foraging during the spring stopover;
- monitor the presence and breeding activity of large raptors (e.g. golden eagle, bald eagle, osprey, red-tailed hawk and rough-legged hawk) in the Project area; and
- monitor avifauna for changes in distribution and abundance through re-surveying established transects.

7.6.2 Participants' Views

A number of participants expressed concern regarding the loss of ashkui. Many participants concluded it was not feasible to recreate ashkui sites. In particular, Grand RiverKeeper Labrador Inc. pointed out that current knowledge regarding use of ashkui was limited. It stated that current productivity of ashkui resulted from years of sediment trapping that would not occur rapidly post-impoundment.

Environment Canada stated concerns that new ashkui would not occur at inflow points as early as the traditional ashkui due to the impounded nature of the reservoirs versus the current flow within the watershed. The Department also stated that it was not solely concerned with the direct loss of these habitats, but also the alteration of ecological function in these areas.

With regard to surf scoters (a species of concern), Environment Canada noted that open water is required for this species during the spring. Environment Canada was confident that remaining ashkui sites could continue to be used by this and other species. However, birds might experience higher competition and lower reproductive success due to reduced frequency and higher utilization of fewer ashkui sites. Although the Department did not expect the Project to affect surf scoters at a population scale, it mentioned concerns regarding indirect effects of habitat loss or habitat degradation on scoter productivity. Environment Canada noted that the EIS had limited field data on waterfowl, particularly surf scoter, and therefore the distribution of waterfowl was not well understood. As little was known about the formation and use of ashkui, Environment Canada recommended an additional year of field studies on abundance and distribution of surf scoter and a behavioural study to determine the extent of foraging during the spring stopover, to which Nalcor agreed. Additional information on the use of ashkui by people is provided in Chapter 9.

A participant noted that waterfowl prefer open areas around ashkui because predators were more easily visible and questioned whether new ashkui, which would be closed in by trees, would be used by waterfowl. He also questioned the fate of the dense population of wetland sparrows, ptarmigan and geese at Upper Brook when it would be flooded.

Several participants said that the flooding would affect migrating patterns of birds and that transmission lines would affect bird mortality. One participant also expressed concerns regarding clearing during nesting season, stating that birds such as swallows would not return to

nesting sites if disturbed. He also commented that mortality would be an issue for waterfowl if reservoir filling occurred during the spring months.

Environment Canada stated that the period from May to July would be a time when bird nesting would be occurring and that land clearing could result in destruction of eggs, nests and young in contravention of the *Migratory Birds Convention Act*. The Department stated that it had enforcement powers and capability but no permitting authority under this Act. In response to Nalcor's suggestion of using an avifauna management plan, Environment Canada responded that identification of nests prior to clearing was a challenge and likely to fail as mitigation.

Environment Canada concurred with Nalcor on the identification of species at risk in Labrador and noted that only harlequin duck, rusty blackbird, common nighthawk and olive-sided flycatcher are likely to occur in the Project footprint. The Province maintains responsibility for rusty blackbird, and it was stated by Environment Canada that critical habitat had not been identified for the federally listed bird species.

The Department of Environment and Conservation recommended that concerns associated with identified species at risk be mitigated through the development of Environmental Protection Plans and effects monitoring. It stated that plans should be designed to schedule construction activities to mitigate for disturbance and incidental take. Monitoring plans should also contain components for surveying species pre-, during and post-construction in order to apply adaptive management if needed. The Department noted that Nalcor indicated that it would consider many of these mitigation measures. The Department also recommended including ptarmigan in the assessment and assessing diversity, home range and habitat usage of raptors.

Environment Canada also stated concerns with the methodology used to assess the abundance and distribution of birds in the Project area, noting that Nalcor used a low sample size to draw conclusions. However, Environment Canada stated that breeding habitat availability was not a threat for species at risk and the direct impacts of the Project on breeding waterfowl would be restricted to the inundated area. Although it recognized that Nalcor's assessment was poor, it cited experience that there would be minimal direct impact of the Project for most of the waterfowl that breed in the Project area.

Environment Canada acknowledged that a large percentage of riparian habitats would be lost but noted that riparian habitat would be available outside the Project footprint. At the landscape level, the Department stated that the Project would not have a great impact on the availability of this habitat after mitigation measures were implemented. However, as wetland sparrows are dependent on wetland and riparian habitat, follow-up was recommended. There are no species, habitats or high population densities located inside the Project footprint that are not also located outside the footprint.

7.6.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on birds, the Panel considered the following factors to be particularly relevant:

- the key indicator approach taken by Nalcor in its EIS;
- the presence of a number of species at risk in the Project area, including the common nighthawk, the olive-sided flycatcher, the gray-cheeked thrush, the rusty blackbird, and the harlequin duck; and
- the presence of a number of migratory birds in the Project area, particularly during the spring and summer months.

Based on the information available the Panel concludes that bird species are not likely to be significantly affected by the Project. No final determination was possible with respect to listed bird species.

The Panel has reached this conclusion mainly because it appears that there is abundant primary habitat available outside the Project area. The effect of the Project on listed bird species will have to be confirmed once recovery strategies are completed and critical habitat is identified. In any event, there does appear to be sufficient uncertainty about the exact interaction between the Project and these listed species that a careful monitoring program, along the lines of what was proposed by the provincial Department of Environment and Conservation, would be warranted if the Project were to proceed. Given the threatened status of these species, an active adaptive management approach would also be warranted.

The Panel heard a range of views on the formation of new ashkui and the effect of the expected loss of ashkui on bird species.

The Panel concludes that it is uncertain that ashkui will form as predicted by Nalcor. If ashkui do not re-form as productive habitat, the Panel concludes that it will be a loss in habitat for waterfowl. The impact of the loss of ashkui on terrestrial species is not likely to be significant given the abundance of alternate habitat.

The social and cultural effects of the loss of ashkui are addressed in Chapter 9.

The issue of compliance with the *Migratory Birds Convention Act*, particularly during reservoir clearing activities, should be resolved between Nalcor and Environment Canada prior to the start of any clearing activity. The state of affairs that was presented to the Panel, where Environment Canada indicated that the only way to comply with the *Migratory Birds Convention Act* is to avoid clearing between May 1 and July 31, and Nalcor indicated that it does not intend to clear during that period in a manner consistent with the *Migratory Birds Convention Act*, is not acceptable.

RECOMMENDATION 7.8 Effect of reservoir preparation activities on migratory birds

The Panel recommends that, if the Project is approved, Nalcor and Environment Canada negotiate an agreement prior to reservoir preparation regarding whether and how clearing could proceed between May and July without violating the *Migratory Birds Convention Act*. To initiate this process, Nalcor should be required to submit a plan describing how it would carry out clearing activities during this period in compliance with the *Migratory Birds Convention Act*.

7.7 VEGETATION MANAGEMENT

7.7.1 Nalcor's Views

Nalcor stated that vegetation management of the transmission line right-of-way would include the removal of trees that may threaten the security of the system and the control of fast-growing shrubs that impede access. Vegetation management would begin three to four years after

construction and occur every 8 to 10 years thereafter. Nalcor stated that a detailed survey would be necessary prior to beginning the vegetation management program. Crews would use approved herbicides sprayed using a tracked vehicle. The quantities of chemicals used will depend largely on terrain, as well as quantity and type of vegetation.

Because vegetation management will occur infrequently, Project-related human activity in the area would be infrequent. Use of herbicides would not noticeably affect abundance and distribution of any key indicator species. Temporary disturbance is possible, but these activities would occur over a relatively small area compared to construction activities. In order to avoid impacts to breeding sites, Nalcor would work outside of breeding season where possible and follow Environmental Protection Plan procedures around any active nests. Nalcor did not anticipate that the planned vegetation management strategy would reduce current browsing habitat for terrestrial species.

7.7.2 Participants' Views

Participants raised concerns regarding the effects of chlorinated pesticides including 2,4-D, Tordon 101 and Garlon. The provincial Department of Environment and Conservation discussed the toxicity to humans and animals of the various herbicides. In all cases, the Department indicated that toxicity levels would be low and that herbicide application should not be a concern. It also noted that 2,4-D was reviewed by Health Canada in 2008 and its use was restricted in Ontario but exceptions were made for vegetation control.

The Department highlighted the regulatory provisions that would require Nalcor to inform local residents of herbicide application including public notification and signage at the treated area. In collaboration with Nalcor, the Department could also decide that some other form of public communication may be better suited to this particular region. It noted that notification was designed to discourage people from entering a freshly treated area, not to tell them to avoid these areas permanently. There are no requirements to remove signage after a certain number of years following treatment.

Sierra Club Atlantic disagreed with the Department of Environment and Conservation's opinion that the herbicides proposed for vegetation management would have low toxicity levels for humans because it had not considered their sub-lethal effects on the immune system, the central nervous system and other biological systems. It also stated that the test used to determine toxicity levels was flawed because it calculates the concentration at which the substance can negatively affect only 50 percent of the test subjects.

7.7.3 Panel Conclusions and Recommendations

In reaching its conclusions on the effects of the Project on vegetation management, the Panel considered the following factors to be particularly relevant:

- the regulatory approach to the use of herbicides;
- the uncertainty over long-term effects of exposure to herbicides; and
- the precautionary approach.

The Panel concludes that there is a reasonable regulatory process in place for the use of herbicides. Responsibility for the safe use of herbicides is split between the federal and provincial governments. The federal government approves herbicides for potential use in Canada. Provinces make final decisions about the use of specific herbicides approved for use in Canada and determine the conditions for their use. In spite of this approach, there are inherent

uncertainties in approving herbicides based on short-term trials. In light of the precautionary approach, and in an effort to minimize the risk of harmful effects that may only become apparent through long-term exposure, the Panel concludes that the use of herbicides should be limited to situations where, in the judgment of provincial regulators, there is no reasonable alternative vegetation control method available.

RECOMMENDATION 7.9 Vegetation control

The Panel recommends that, if the Project is approved, Nalcor be required to restrict the use of chemical herbicides to areas where alternative vegetation control is not reasonably possible. Approval of the use of herbicides should only be granted after Nalcor has submitted an overall vegetation control plan to the provincial Department of Environment and Conservation, demonstrating that all alternatives have been adequately explored and the use of non-chemical approaches maximized.

7.8 MONITORING, FOLLOW-UP AND ADAPTIVE MANAGEMENT

The Project, if it should proceed, would result in a range of effects on the terrestrial environment. These effects raise a number of important issues that require ongoing monitoring. Furthermore, there is some uncertainty about the extent of the effects and the effectiveness of mitigation measures. The Panel has therefore considered the need for ongoing monitoring, reporting, follow-up and adaptive management with respect to terrestrial issues.

RECOMMENDATION 7.10 Monitoring, follow-up and adaptive management for the terrestrial environment

The Panel recommends that, if the Project is approved and in addition to its monitoring commitments listed in Chapter 7, Terrestrial Environment, Nalcor should carry out the following monitoring programs:

- monitor the effectiveness of riparian and wetland habitat compensation work, including the effect on wetland sparrows;
- monitor the response of the Red Wine Mountain caribou herd including any population changes through the construction phase and in the early part of the operation phase;
- monitor wolf predation of caribou, particularly the Red Wine Mountain herd;
- monitor interactions of the George River caribou herd with Project activities and facilities and identify any impacts;
- monitor ashkui formation in the Project area;
- monitor direct and indirect impacts on waterfowl, such as waterfowl adjustment to changes in riparian habitat, and changes in location and formation of ashkui;
- confirm the presence of and monitor the impact of the Project on salamanders and spring peepers;
- develop a detailed mitigation and monitoring plan for all listed species for approval by the provincial Department of Environment and Conservation;
- confirm the presence outside the flood zone of the eight plant species identified by Nalcor as unique to the river valley, plus the two additional species listed by the Department of Environment and Conservation (marsh horsetail and hidden fruit bladderwort) and develop a detailed mitigation plan for these plant species for approval by the Department;
- monitor the impact of the Project on furbearers, small game, small mammals, and black bears; and

- collaborate with the Department of Environment and Conservation to develop an appropriate approach to monitor pine marten in areas affected by the Project where there is no trapping activity.

8 LAND AND RESOURCE USE

This chapter addresses effects of the Project on harvesting activities (hunting, trapping, fishing, and berry picking), cabins, winter travel, navigation, forestry and other resource-based activities (mining, agriculture and ecotourism). The effects discussed in this chapter would apply to Aboriginal and non-Aboriginal land and resource users alike. Effects related specifically to current use of land and resources for traditional purposes by Aboriginal persons are addressed in Chapter 9.

8.1 HARVESTING ACTIVITIES

8.1.1 Nalcor's Views

Nalcor reported that caribou hunting in the Assessment area is concentrated between the Churchill River and the Trans Labrador Highway from Churchill Falls to Metchin River and moose hunting occurs north of Lake Winokapau and between Pinus River and the confluence of the Churchill River and the Minipi River, along the north bank of the Churchill River. Hunting of small game animals (ptarmigan, grouse, snowshoe hare, and porcupine) and migratory birds occurs along the full length of the Churchill River, including in wetlands along the Trans Labrador Highway.

The most heavily trapped areas are downstream of Muskrat Falls, including on the many tributaries that intersect with the Trans Labrador Highway, and along the shores of Goose Bay. Marten is the preferred species for trapping, both in terms of numbers taken and market value.

Project-related loss of habitat could affect the distribution and abundance of some species and could affect and reduce hunting and trapping opportunities and patterns, particularly for small game animals and migratory birds. However, Nalcor predicted that the viability of harvested species populations present in the Assessment area (such as caribou from the George River herd, ruffed grouse, porcupine, marten, moose and Canada goose) would not be affected by the Project and would remain at a level necessary to continue to support hunting and trapping. Further information on the effects of the Project on wildlife populations is provided in Chapter 7.

With respect to trapping, Nalcor observed that some species could move into the new habitat created by the reservoirs, including the riparian zone, and this could result in new trapping opportunities. The portion of trapping areas that would be flooded would also be low relative to trapping areas available in the region.

Nalcor also proposed a trapping compensation program for trappers who can prove that they have previously and continuously trapped in the area for at least ten years prior to start of construction. Nalcor would compensate for present and future loss of income, costs of temporary or permanent relocation and loss or damage to property or equipment in kind or by cash payment, based on current market value. Nalcor committed to finalizing the trapping compensation program before the start of construction. Nalcor also committed to provide information about Project activities to trappers so that adverse effects could be mitigated or avoided.

The trapping compensation program would not apply to trapping losses sustained as a result of the development of Churchill Falls.

Based on its baseline studies, Nalcor concluded that only a small proportion of the Central Labrador population practice fishing on the lower Churchill River in a typical year. A majority of those who fished on the lower Churchill River during the baseline period were residents of Churchill Falls, followed by residents of Happy Valley-Goose Bay, Mud Lake, and North West River.

The preferred locations for fishing were identified as the Churchill Falls tailrace, Muskrat Falls, Gull Island, Minipi River, Cache River, McKenzie River and Lake Winokapau. Brook trout, ouananiche and lake trout were the most commonly harvested species from the lower Churchill River during the baseline period. Whitefish, rainbow smelt, and pike were also harvested, but to a much lesser extent.

While there would be a reduction in suitable habitat conditions for the more heavily fished species such as lake trout, brook trout and ouananiche in the reservoirs following impoundment, Nalcor predicted a net total increase in productive habitat conditions after that. Expected fish habitat conditions and fish assemblage in the reservoirs are addressed in Chapter 6. On the other hand, access to preferred fishing locations, such as upstream from Muskrat Falls and Gull Island, could be interrupted or affected permanently by the Project.

Nalcor expected that fish consumption advisories would be issued for the main stem of the lower Churchill River to limit human exposure to methylmercury. These advisories could result in decreased fishing opportunities. However, Nalcor reported that most fishing currently occurs in Lake Melville or in tributaries, outside of the area where fish consumption advisories would likely be implemented, and these areas would still remain accessible for fishing. Nalcor also committed to investigate the possibility of rehabilitating Grand Lake in collaboration with Fisheries and Oceans Canada and the community of North West River as part of its Fish Habitat Compensation Strategy. This could increase fishing opportunities in the region, outside of the areas where fish consumption advisories would likely be implemented.

A portion of the habitat of four species (brook trout, Atlantic salmon, Arctic char, and rainbow smelt) fished in Lake Melville is located in the main stem of the Churchill River below Muskrat Falls. Given that flows would remain unchanged in this stretch of the river, Nalcor was not anticipating effects on any of these species or, in general, on fisheries in Lake Melville. Further information on the effects of the Project on fish stocks below Muskrat Falls is provided in Chapter 6. Brook trout is the only species fished in Lake Melville for which consumption advisories might be implemented. Nalcor also did not expect any adverse effects on seal harvesting in Lake Melville.

Berry Picking

Nalcor indicated that the Project would result in the loss of several hectares of burn-over that provide suitable conditions for berry growth. However, Nalcor noted that this would represent only a small portion of such areas available throughout the Assessment area and berry populations would remain sustainable.

Nalcor also reported that two popular berry-picking areas near Muskrat Falls and Gull Island on the north side of the river would be located above the reservoir limits and would not be flooded.

By committing to adhere to regulatory requirements for the application of herbicides along the transmission lines corridor, Nalcor concluded that any health risks to humans using the corridor to pick berries would be avoided. Nalcor would also issue public advisories in compliance with provincial regulations and post public notices along the corridor to inform berry pickers of herbicide applications.

Access

Construction activities would not pose a danger to harvesters provided they respect access restrictions put in place to protect the safety of the public at worksites and along active haul roads. Nalcor would also ask the provincial Department of Environment and Conservation to close construction areas to hunting pursuant to the *Wildlife Regulations*. Hunting restrictions, enforced by government officials, are frequently established for resource development projects and logging areas throughout the province.

During impoundment of the reservoirs, advance community announcement and public notices would warn land and resource users about the time and nature of imminent flooding and would discourage them from entering the affected areas.

Approximately 375 kilometres of new or upgraded roads would be necessary for accessing construction sites and for reservoir clearing activities. Further information on the location of these roads is provided in Chapter 4. Nalcor stated that only 15 to 30 kilometres of access roads would remain permanently accessible at the end of the construction period.

While these permanent access roads might provide increased opportunities for harvesting activities, putting greater pressures on harvested resources and hence reducing the likelihood of harvesting success, Nalcor concluded that road reclamation and the implementation of a no-harvesting policy would mitigate the potential adverse effects of increased accessibility.

The no-harvesting policy for all employees, contractors and service providers would apply to all worksites (construction and reservoir clearing), camps, access roads, transmission lines corridor and during transport to and from Project sites. Compliance with the policy would be a condition of employment and would be incorporated into work place policies and procedures through labour negotiation and the Impacts and Benefits Agreement with Innu Nation. Nalcor would also prohibit firearms.

Nalcor predicted that the Project would not cause any significant amount of population growth in Happy Valley-Goose Bay because of the use of self-contained accommodation camps. Nevertheless, Nalcor acknowledged that increased access and activity in the Project area (including increased access caused by a number of existing or proposed linear developments such as the Trans Labrador Highway and additional transmission) may require enforcement by regulatory and resource management authorities and agencies so that activities are undertaken responsibly and sustainably. Additional areas might need to be designated for protection and conservation. Nalcor anticipated that government regulations and wildlife adaptive management measures to be undertaken by the Government of Newfoundland and Labrador would address adverse issues resulting from increased regional access.

Monitoring and Follow Up

Nalcor considered it would generally be the responsibility of provincial and federal authorities to monitor changes in the distribution and intensity of land and resource use activities in the Project area. However, Nalcor committed to provide Project-related information on a quarterly basis to these authorities in order to assist them in carrying out their responsibilities. For example, Nalcor would provide information related to the location, condition and status of all new access roads and the results of monitoring programs to be conducted related to fish and wildlife. The nature and extent of any other information to be provided by Nalcor would be based on the requirements of the responsible government agencies. Nalcor also committed to monitor marten and porcupine trapping during the operation period to compare with pre-Project trapping data.

Project Sequencing

A change in Project sequencing would not result in a change in the area of land that would be inundated or in the amount of temporary or permanent new or upgraded roads that would be needed.

The proportional loss of wildlife habitat and associated hunting and trapping opportunities resulting from inundation or infrastructure would not change regardless of Project sequencing. The net increase in fish habitat would also not change. There would also be no anticipated change to the potential need for consumption advisories as a result of changes in Project sequencing. However, in the event of a delay in Gull Island going forward, consumption advisories for methylmercury could be in place for a longer period of time.

Regardless of Project sequencing, there would be no further effects on fish and wildlife habitat during the operation period.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to harvesting activities included the following:

- request that active work areas be closed to hunting pursuant to the *Wildlife Regulations*;
- limit the amount of new roads built for Project construction that would remain accessible during the operation phase;
- finalize the trapping compensation program before the start of construction and provide information to trappers on Project-related activities;
- consider the possibility of increasing fishing opportunities in Grand Lake by implementing fish habitat compensation measures;
- implement a no-harvesting and a no-firearm policy for all Project employees;
- issue public advisories in compliance with provincial regulations and post public notices to inform berry pickers of herbicide applications;
- notify the public about imminent flooding of the reservoirs;
- rely on government regulations and wildlife adaptive management measures to be undertaken by the provincial government to address adverse issues resulting from increased access to the land in the region;
- provide Project-related information on a quarterly basis to the authorities responsible for land and resource use, such as the status of new access roads and the results of monitoring programs related to fish and wildlife; and
- assess marten and porcupine trapping data post-Project and compare with pre-Project trapping data.

8.1.2 Participants' Views

Trapping

Many participants talked about the strong relationship they and their families have had with the Churchill River through trapping. Many descendants of the original trappers still use traditional traplines in the Upper Lake Melville area. Trapping is usually done in close proximity to communities.

Some participants raised the fact that community members lost trapping areas and trapping equipment because of flooding of the Smallwood Reservoir. The fact that these losses were not acknowledged and that compensation would only be provided to members of Innu Nation through the redress provisions of the *Tshash Petapen* Agreement, raised widespread concern. Participants suggested that compensation, such as that envisioned by Nalcor's proposed trapping compensation program, should be considered to address the negative impacts of the development of Churchill Falls on all local trappers.

Fishing

Participants, including Fisheries and Oceans Canada, acknowledged that fishing on the lower Churchill River, in Goose Bay and in Lake Melville plays an important social and cultural role in the lives of Upper Lake Melville residents.

Fisheries and Oceans Canada concurred with Nalcor's conclusion that reservoirs would become healthy aquatic ecosystems and that they could support sustainable fisheries for valued species. However, representatives also expressed uncertainty about how long it would take to reach that point. As a result, they noted that a strong habitat compensation program with monitoring and adaptive management provisions was necessary.

Fisheries and Oceans Canada agreed that measures proposed by Nalcor to mitigate effects of increased pressure on fish stocks (access restriction, removal of stream crossing structures and enforcement of a no-harvesting policy) would conserve fish, reduce pressure on fish stocks and promote the re-establishment of healthy fish stocks in the reservoirs.

Fisheries and Oceans Canada also stated that it was difficult to predict whether there would be effects on fisheries in Lake Melville or if these effects would be positive or negative given the amount of baseline sampling and assessment that Nalcor has carried out to date.

Finally, Fisheries and Oceans Canada committed to monitor changes in fishing access, patterns and activity during the construction and operation periods. If the pressure on fish stocks during the construction and operation periods proves to be unsustainable and if fisheries management in the Project area (such as daily and seasonal bag and possession limits) needs to be modified, Fisheries and Oceans Canada also committed to undertake consultation with local stakeholders.

Other participants predicted that the Project would cause effects on fisheries, including in Lake Melville, similar to those experienced following the development of Churchill Falls. Participants noted for example the decline of cod fisheries in Groswater Bay and Sandwich Bay and speculated whether it was caused by a reduction in sediments flushed out of the Churchill River, by changes to water temperature or clarity, by increased methylmercury level or by changes in the tides. Participants also observed the disappearance of whitefish, salmon and seal at or in tributaries near Muskrat Falls. A participant however reported that these species and others, including trout, seemed to have come back to Muskrat Falls in recent years.

Participants also predicted that there would be increases in saltwater levels once the flow of freshwater from the Churchill River was further regulated, and that those would be detrimental to the feeding habits of trout and salmon, two species for which fishing rights have already been curtailed by Fisheries and Oceans Canada.

Berry Picking

The provincial Department of Environment and Conservation indicated that the toxicity levels of the herbicides that would be used for vegetation management along the transmission lines corridor would be low and herbicide application should not be a concern for berry pickers.

Based on how toxicity testing is conducted, Sierra Club Atlantic disagreed that toxicity levels for humans would be low. The environmental effects of herbicides and proposed vegetation management measures are addressed in Chapter 7.

8.2 CABINS

8.2.1 Nalcor's Views

Nalcor identified 12 cabins that the Project would permanently affect, out of 22 inventoried along the Churchill River. These cabins are subject to Licenses to Occupy that would expire prior to reservoir creation or could be terminated within 30 days by a notice from the Minister of Environment and Conservation. Nalcor communicated with the owners of the affected cabins early during Project planning to inform them of the potential effects of the Project on their cabins. Nalcor would determine the possibility of offering compensation on a case-by-case basis only if a License to Occupy would be cancelled.

Temporary effects on the remaining cabins would consist of increased noise levels and traffic during the construction period. The net effect would depend on proximity and timing of cabin use by their occupants. Noise during the operation period would be negligible.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation and monitoring measures related to cabins included the following:

- notify cabin owners early during Project planning process; and
- consider offering compensation in the event that a License to Occupy must be cancelled.

8.2.2 Participants Views

The provincial Department of Environment and Conservation identified two cabins close to Muskrat Falls that would be potentially located within the Project footprint. In total, less than 10 cabins could be permanently affected by the Project.

The Department stated that Licenses to Occupy were granted with the condition that they could be withdrawn if there was an identified better use of the land, including hydroelectric development. The Department considered that sufficient notice had been given to cabin owners.

At the time of the public hearing, the Department had not been approached by any cabin owner or by Nalcor to cancel any cabin title within the Project footprint. The Department expected that this would happen only when the exact extent of the areas needed for the Project has been identified. In the event that title must be cancelled, the Province would not offer compensation.

8.3 WINTER TRAVEL

8.3.1 Nalcor's Views

Downstream of Muskrat Falls

Mud Lake residents are particularly dependent on a stable ice cover for transportation to and from Happy Valley-Goose Bay. Nalcor reported that there are between 80 to 140 snowmobile crossings by Mud Lake residents per week during the winter season.

On average, Mud Lake residents reported to Nalcor that the first date of crossing by snowmobile in the fall is November 28th. Nalcor calculated standard deviation values for the first snowmobile and boat crossings for the period of 1972 to 2008 and concluded that the considerable year-to-year variability of these records reflects natural climate variability.

Other than Mud Lake residents, snowmobilers also travel over the ice below Muskrat Falls for recreational purposes. Nalcor reported that travelling frequency is very weather-dependent and is at its highest in late February-early March. On a single day, 15 to 20 snowmobiles can be observed crossing the river.

Nalcor predicted that the total transition time between ice and open water below Muskrat Falls – the amount of time that Mud Lake residents would be unable to travel across the river by either snowmobile or boat – would not change during the operation period. However, thermal and dynamic ice modelling conducted by Nalcor predicted that the timing of freeze-up during the operation period would occur up to two weeks later (or up to three weeks later under Nalcor's predicted climate change scenario) than it does currently and the timing of break-up would be delayed by approximately one week.

Nalcor predicted that the volume of ice generated in the reach of the river below Muskrat Falls would be less in post-Project conditions but would remain sufficient for the formation of a stable ice bridge because frazil ice would continue to re-form as ice pans after the water has passed through the turbines. The strength (stability and thickness) of the ice forming the ice bridge would also remain unaffected during the operation period because it is primarily the result of on-going heat loss to the atmosphere that would not change as a result of the Project.

If the Project is approved, Nalcor committed to continue to verify ice dynamic predictions for ice progression, thickness and stability through satellite imagery downstream of Muskrat Falls, including near Mud Lake and Happy Valley-Goose Bay and around the mouth of the Churchill River and Lake Melville. Nalcor expected that people would make their own judgments about whether or not ice conditions are safe based on the information provided through monitoring and follow-up programs.

Nalcor also committed to provide information regarding ice thickness and stability of the Mud Lake ice road during the ice formation and break-up period to the Mud Lake Improvement Committee, the Royal Canadian Mounted Police, the Municipality of Happy Valley-Goose Bay, the Town of North West River and the Sheshatshiu Band Council. Nalcor would work in collaboration with communities to develop the details of these public advisories.

If Mud Lake residents are unable to travel to and from Happy Valley-Goose Bay by snowmobile for a longer period than predicted, Nalcor committed to provide alternate transportation if adverse changes to winter travel conditions could be directly attributed to the Project. The effects of climate change would have to be considered to explain the longer transition period.

For example, Nalcor noted that the delays experienced during the 2009-2010 and 2010-2011 seasons were reasonable examples of what the consequence of climate change may represent without any interference from the Project. Further information on climate change and ice modelling predictions is included in Chapter 5.

Nalcor considered that the provision of alternative transportation in the case that adverse impacts on ice crossing could be attributed to climate change rather than to the Project would be the responsibility of the Province as part of the provincial climate change adaptive program. Nevertheless, Nalcor would continue to work with Mud Lake residents in determining appropriate alternatives.

Nalcor predicted that any changes to the ice regime in Goose Bay and Lake Melville as a result of the Project would be localized and small.

Upstream of Muskrat Falls

Nalcor reported that there are only infrequent river crossings by snowmobile upstream of Muskrat Falls due to the prevalence of open water. Many residents indicated in interviews in preparation for the EIS that although they do travel on the Churchill River in winter along the shorelines, conditions are dangerous and travel must be undertaken with caution and only by those familiar with the River and the range of ice conditions.

Snowmobile crossings on the reservoirs would be safer and more reliable than under existing conditions as a result of the thermal ice covers that would form. While Nalcor's models showed that ice on the reservoir would form and break approximately two weeks later than at present, by the end of winter, ice thickness on the reservoirs would still be in the order of one metre. Ice hinging and hanging dams were not expected to occur. Nalcor committed to conduct an ice observation program throughout the reservoirs.

Less than two kilometres of snowmobile trails could be lost due to reservoir impoundment but Nalcor committed to develop the same amount of new trails to offset this loss. Nalcor also predicted that remaining new access roads constructed for reservoir preparation would provide increased snowmobiling opportunities. However, Nalcor would decommission temporary access roads in such a way that snowmobiles would not be able to use them.

Project Sequencing

A change in Project sequencing would result in the same delay in ice freeze-up and break-up in the area of Mud Lake. In the event that the Muskrat Falls facility started operation prior to the construction of the Gull Island facility, the delay would be reduced because of the decreased influence of the heat sink from the reservoirs without Gull Island.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to winter travel included the following:

- provide information regarding ice thickness and stability at select locations on the river, including the ice road to Mud Lake, to local communities and stakeholders and issue public advisories as needed;
- provide alternative travel arrangements for Mud Lake residents to and from Happy Valley-Goose Bay if they are unable to travel over the ice for longer than existing periods because of the Project;

- develop snowmobile trails equal to the amount that would be flooded;
- verify ice dynamic predictions for ice progression, thickness and stability through satellite imagery downstream of Muskrat Falls, including near Mud Lake and Happy Valley-Goose Bay and around the mouth of the Churchill River and Lake Melville; and
- conduct an ice observation program, including timing of formation/break-up and amount of ice and open water areas, including ashkui, throughout the reservoirs and downstream of Muskrat Falls, including ice formation around the mouth of the Churchill River and Lake Melville.

8.3.2 Participants' Views

The provincial Department of Environment and Conservation agreed with Nalcor's predictions regarding ice dynamics near Happy Valley-Goose Bay and Mud Lake. However, the Department also stated that the fact that the availability of the ice road to Mud Lake would be reduced by approximately one week was an important issue because it would change current travel patterns. The Department noted that Nalcor had not presented any mitigation measures to reduce or eliminate adverse effects with respect to this issue.

The Department recommended that a monitoring plan be implemented to verify the accuracy of the predictions. Nalcor would be obligated to submit annual post-season reports for review and approval. The results of the monitoring program would need to be communicated to local residents in near real time format, using easy-to-understand visual products, including high-resolution satellite imagery, and focusing on the area of the ice road.

With respect to the potential effects of climate change on the length of the transition period, above and beyond the effects of the Project, the Department was unable to confirm whether there was any regulatory authority within the provincial government to implement adaptation measures in the event that Mud Lake residents were unable to travel to and from their community for a period of time. Provincial representatives were also unable to say which provincial department would be responsible in this regard.

Finally, the Department would not require that monitoring of ice conditions be conducted in Goose Bay and Lake Melville because it agreed with Nalcor's conclusion that changes in that area would only be localized and small. If predictions prove to be inaccurate however, Nalcor's monitoring requirements would have to be extended to that area.

Fisheries and Oceans Canada recommended that modelling should be conducted to determine the effects of the Project on ice formation around the mouth of the Churchill River, in Goose Bay and in Lake Melville. The timing and extent of ice formation should also be monitored before and after reservoir impoundment. Uncertainty regarding ice conditions would have implications for local residents who wish to access fishery resources in this area.

Residents of Mud Lake have an intimate knowledge of ice dynamics – some community members go out everyday to check the evolution of the ice – and they see differences from year to year in how long it takes the ice to form and break up. For example, they were of the opinion that raw sewage flowing into the river from Happy Valley-Goose Bay has had negative impacts on ice conditions and they also noticed differences since the construction of the Black Rock Bridge. A participant stated that the combined experience acquired over many years of marking a safe ice bridge over the river would mean very little in post-Project conditions and may result in Mud Lake residents not trusting future ice crossings should the Project go ahead. They also doubted Nalcor's ability to accurately predict ice conditions. For example, modelling overlooked some features of the river until residents mentioned them to Nalcor.

Participants have observed safe ice bridges being formed almost overnight some years because ice formed upstream of Mud Lake was broken into smaller pieces by going over Muskrat Falls and made ideal "building blocks" which raft together and became thicker in a short period of time when temperatures were sufficiently low. However, some participants thought that the Project would reduce the supply of suitable ice and it would take much longer to create a safe bridge from thinner ice pans.

Mud Lake residents also raised concerns that changes in channel morphology below Muskrat Falls would affect ice dynamics since they have observed that sandbars play an important role in ice formation by blocking ice coming from upstream.

Although Mud Lake residents have adapted to being unable to cross the river by snowmobile or boat during certain periods of the year, they indicated that this would be more difficult if the transition periods become longer on a regular basis. This would have a major impact on their way of life, particularly for older residents and might lead to some residents moving away from the community. Mud Lake residents did not favour a road connection to their community because it would alter Mud Lake's unique character.

Inuit participants expressed concerns about ice conditions and safety of ice travel. They predicted that changes in ice conditions that they observed on Lake Melville following the development of Churchill Falls would be exacerbated by the Project. These changes included softer ice and quicker melting rates. They would not be able to trust traditional ice knowledge and travel routes.

The Nunatsiavut Government asserted that change in ice dynamics in Lake Melville resulting from altered river flow, water levels and salinity levels would adversely affect ice travel. It gave the example of the La Grande system in Quebec where ice conditions downstream were so unstable that it was forbidden to travel over ice across the river at its mouth.

The Nunatsiavut Government considered that Nalcor had underestimated the influence of the Churchill River and its tributaries on ice dynamics in Lake Melville and it was inappropriate not to model ice conditions in Goose Bay and beyond. To address uncertainty in this regard, the Nunatsiavut Government recommended that ice travel frequency and patterns (both within the Project footprint and below Muskrat Falls in Lake Melville to Rigolet) be considered as indicator in the design and implementation of baseline establishment and monitoring and follow-up programs. Additional information on the effects of the Project on current land and resource use for traditional purposes by Inuit is provided in Chapter 9.

Snowmobile was reported to be a mode of transportation frequently used by Labrador Innu to travel throughout their territory to practice land and resource activities. Being able to travel by snowmobile could positively affect the practice of land and resource use activities by giving access to harvesting areas that would otherwise be hard to reach. However, this is assuming that Labrador Innu would be willing to use the reservoirs as a transportation route. Additional information on the effects of the Project on current land and resource use for traditional purposes by Labrador Innu is provided in Chapter 9.

8.4 NAVIGATION

8.4.1 Nalcor's Views

Nalcor reported that the majority of navigation on the Churchill River occurs below Muskrat Falls and between Churchill Falls and the lower end of Lake Winokapau. Some navigation occurs

between these two areas but is limited and often associated with travel down the entire length of the river (approximately 12 groups per year). Navigation is closely linked to cabin access and recreational and harvesting activities. Boat access points exist at the Churchill Falls tailrace and at Gull Island and Muskrat Falls.

Below Muskrat Falls, Nalcor estimated that during the open-water season (usually between May and late November/early December), approximately 13 boats from Mud Lake cross the river between four and seven times per week. This equate to between 50 and 91 crossings per week.

The Project would cause short-term and intermittent access interruptions over only a small portion of the river. There would be no noticeable effects on navigation from the use of small passenger boats and cable ferry carrying Project workers, equipment and materials across the river at Gull Island and from associated temporary docking facilities given that those would be constructed and operated in accordance with regulations.

The temporary construction bridge to be located approximately one kilometre upstream of Gull Island would also be constructed in accordance with regulations and would have a clear span of approximately 140 metres and a bridge clearance of approximately 20 metres above normal water level. It would be decommissioned and removed at the end of its operational life. Nalcor expected that its installation, operation, and removal would have no effect on navigation.

When cofferdams are in place at Gull Island, river traffic would be required to portage around them by using the existing portage route on the north riverbank. Nalcor would modify this existing portage route to provide better access around the construction site and to accommodate higher river elevations during the operation period. With respect to Muskrat Falls, given that the falls are currently not navigable, Nalcor submitted that the Project would have no effect on navigation at that location. At both Gull Island and Muskrat Falls, access to portage routes would be maintained with brief exceptions (less than two weeks) when reservoir clearing activities are taking place nearby.

Nalcor committed to use safety signage and public advisories (newspaper or radio) to inform boaters of the potential navigational hazards due to the presence of construction sites and activities. Floating safety booms would be put in place to direct boaters towards portage routes. Nalcor also committed to replace boat launches that would be permanently affected by construction at locations as close as possible to the original ones, in consultation with stakeholders and based on accessibility, safety and technical constraints. Nalcor stated that it may also consult with stakeholders to identify and implement feasible changes to the construction schedule, such as minor pause or re-sequencing, to minimize disruption to boating due to construction activities.

Nalcor decided against using log driving to transport timber to landing stations along the river after Transport Canada objected to that possibility on the basis that it would create important navigation hazards.

Below Muskrat Falls, reservoir impoundment could temporarily disrupt navigation due to the availability of only 30 percent of the average current flow. In the event that Mud Lake residents are prevented from travelling to Happy Valley-Goose Bay by boat during the impoundment periods because of decreased flow, Nalcor committed to offer alternate transportation opportunities in consultation with residents.

Immediately following impoundment, trees left in the stick-up zones could pose a hazard to navigation for two to three years. These trees would likely be partially submerged at low supply level or fully submerged but just below the surface at full supply level. However, after two to

three years, ice and waves would remove all exposed trees. According to Nalcor however, most trees in the flood zone would be sufficiently submerged below the low supply level as to not pose a hazard to navigation.

In areas where mechanical clearing would be impossible, protruding trees could continue to pose navigational hazards during the operation period in spite of the action of ice and waves. In this case, Nalcor committed to monitor and remove these trees manually or with barges to below water levels. Nalcor also committed to continue discussions with Transport Canada regarding potential key areas where accessibility would need to be maintained and where manual clearing may be necessary. These areas would be identified on a continuing basis, as work on the ground progresses and the locations of areas that would not be cleared are confirmed.

Measures that would be implemented to prevent floating trash and debris from interfering with the generation facilities, either by handling trash and debris found in the reservoirs before reaching the facilities or by processing trash and debris after reaching the facilities, would also serve to avoid adverse effects on navigation and shore access.

Nalcor agreed with Transport Canada's recommendation with respect to imposing terms and conditions designed to inform the public of navigational risks posed by trees remaining in the stick-up zones at full supply level.

Overall, for the operation period, Nalcor anticipated that navigability would be improved because reservoirs would have slower moving water and there would be a general deepening of water towards each powerhouse and no increase in wind. While the overall range in water levels would be marginally greater, daily and seasonal fluctuation frequency would be reduced because reservoirs would be managed as close as possible to full supply levels.

Nalcor committed to implement safety and warning measures to inform boaters of the presence of hydroelectric structures. These could include safety signage, floating booms, public advisories, fences, audible warning and signs and education and awareness campaigns (television, schools, and educational material).

Below Muskrat Falls, average water levels and flows would not change beyond current natural variability during the operation period. The anticipated change in channel pattern from a braided to a meandering channel would not affect navigation but the location of sandbars could shift slightly from year to year. There would also be a minimal shift in the timing of the open-water season due to the predicted delay in ice freeze-up and break-up. As recommended by Transport Canada, Nalcor committed to monitor and mitigate downstream effects of the Project on navigational patterns between Mud Lake and Happy Valley-Goose Bay.

Project sequencing

Nalcor stated that a change in the timing or sequencing of Project phases would not change the overall depths of the reservoirs or the velocity of the river as evaluated in the EIS. Depending on the length of time between the completion of Muskrat Falls and the initiation of Gull Island construction, the increased navigability conditions that Nalcor is anticipating on the Gull Island reservoir could be delayed.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to navigation included the following:

- use safety signage, floating booms, public advisories, fences, audible warning and signs and education and awareness campaigns (television, schools, and educational material) to inform boaters of the potential navigational hazards due to Project construction sites and activities and the presence of hydroelectric facilities;
- inform the public of navigational risks posed by trees remaining in the stick-up zones at full supply level;
- provide portages around the dams and maintain access to existing portage routes;
- replace boat launches permanently affected by construction at locations as close as feasible to the original ones, in consultation with stakeholders and based on accessibility, safety and technical constraints;
- implement feasible changes to the construction schedule to minimize disruption to boating due to construction activities;
- provide alternative transportation for Mud Lake residents if they are prevented from traveling to Happy Valley-Goose Bay by boat due to low water levels during the impoundment period;
- monitor trees remaining in the stick-up zones within the reservoirs and remove them mechanically or manually to below low water levels; and
- monitor downstream effects of the Project on navigational patterns between Mud Lake and Happy Valley-Goose Bay.

8.4.2 Participants' Views

The lower Churchill River and many of its tributaries were deemed navigable by Transport Canada and navigation was identified as a valued social and cultural component. Transport Canada defined a "navigable" waterway as any body of water capable of being navigated by the public. A water system would still be deemed navigable even if there were interruptions in navigation at impassable points, such as dams, or due to seasonal fluctuations. Determination of navigability was based on the entire river system, not just on the Project footprint.

The Project would require an approval under the *Navigable Waters Protection Act* to be able to proceed because Transport Canada determined that it could result in a substantial interference to navigation. As a result, the Project would be subject to terms and conditions preventing significant adverse impacts on navigation and protecting the public's right to safe navigation. These terms and conditions would be confirmed once engineering drawings and detailed timelines of construction activities are available.

With respect to reservoir impoundment, Transport Canada agreed that Nalcor's proposed rate of flooding would limit imminent risk to public safety.

Transport Canada also agreed that most trees left in the stick-up zones would be removed within two to three years after impoundment through ice and wave action. In addition, given the type of boats typically used on the Churchill River (canoe, kayaks, motor boats), only trees left very close to the surface could be an impediment to navigation. Nevertheless, Transport Canada considered stipulating terms and conditions related to the monitoring of the stick-up zones and the way to inform the navigating public of these risks.

Transport Canada may require Nalcor to make available river charts showing navigational hazards in the stick-up zones and expected relative water depths along stretches of the river. While Nalcor would retain some liability relative to navigation conditions, it would be the responsibility of individual boaters to be aware of navigation conditions based on available information.

Below Muskrat Falls, Transport Canada stated that while the predicted one-week increase in the open water season would be permanent and irreversible, it would not be a substantial impact on navigation. However, Transport Canada stated that it could require Nalcor to monitor the impacts to navigation between Mud Lake and Happy Valley-Goose Bay to determine any long-term impacts. Transport Canada could also require Nalcor to monitor shifts in channel morphology to ensure that navigational patterns would not be substantially affected by them.

Transport Canada also considered for possible inclusion as terms and conditions measures related to portage routes, navigational hazard signage, establishment of construction safety zones and installation of safety booms.

Transport Canada would require Nalcor to notify stakeholders and local residents and allow them to provide input on potential navigational concerns. Transport Canada would consider all comments received when determining terms and conditions, such as where access points should be maintained. Information received through the Panel process would also be considered. Direct consultation, including with Aboriginal groups, was also expected. Given the scale of the Project, Transport Canada expected a high level of consultation.

In addition to the monitoring of navigational hazards throughout the reservoirs and of navigation patterns between Mud Lake and Happy Valley-Goose Bay, Transport Canada was considering requesting Nalcor to provide monitoring and follow-up results about navigation use of the reservoirs, the usage of portage routes and the length of the open-water season at select locations along the river. The results of all monitoring and follow-up activities requested by Transport Canada would have to be provided to the Department.

In the event of non-compliance by Nalcor with its terms and conditions, Transport Canada could impose enforcement and compliance measures.

The sinking of a tug boat near Gull Island in 2007 was raised by several participants as an existing obstacle to navigation. Transport Canada determined that the sunken boat did not result in an imminent risk to navigational safety and did not require removal. Similarly, Transport Canada noted that the Black Rock Bridge would continue to allow the passage of boats. Transport Canada did not consider how the Project would act cumulatively with the effects of the development of Churchill Falls because information on navigation conditions that existed before that project was not available.

Other participants observed changes in navigation conditions following the development of Churchill Falls, including bank erosion, shifting sandbars and seasonal changes in water depths and water levels. Increased deposition and sandbars in particular make it impossible now to cross directly between Mud Lake and Happy Valley-Goose Bay. The Nunatsiavut Government also pointed out that after the development of Churchill Falls, changes in tides and water depths observed in Lake Melville as far as the Narrows and going towards Rigolet, negatively affected navigation. Participants predicted that the Project would exacerbate these changes.

Local boaters and residents of Mud Lake doubted the ability of Nalcor to predict accurately how the Project would affect navigation, including with respect to the timing of the open-water season. Participants highlighted the dynamic conditions that currently exist, including the

movement of sandbars and frequent changes in water depths, to underline the difficulties in making predictions.

Participants also predicted that trees left standing just below the water surface in the reservoirs would pose dangerous conditions for navigation.

8.5 FORESTRY

The implications for forestry of the various alternative means of preparing the reservoirs are addressed in Chapter 4.

8.5.1 Nalcor's Views

Nalcor reported that the majority of the Project would be located within Forest Management District 19, which is divided into sub-areas A, B and C. Sub-area 19A is the only one for which a Forest Management Plan has been developed. The Allowable Annual Cut for Forest Management District 19A was established at 200,000 cubic metres.

The lost productive capacity of the flooded land mass would represent a permanent reduction in the inventory to be managed. However, Nalcor estimated that the total area that would be lost to flooding and clearing of the transmission lines' right-of-way would be approximately 34,000 hectares, which represent only about 0.5 percent of the total area of Forest Management District 19. Moreover, Nalcor concluded that there would be no loss of current Allowable Annual Cut because of the Project in District 19A because most of the areas designated for forest harvesting are located outside of the Project footprint.

In the event that reservoir clearing occurs during the time period covered by the Five-Year Operating Plan for Forest Management District 19A Plan (i.e. by 2012), the Plan indicates that planned harvesting activities would be temporarily suspended and harvesting efforts would be concentrated in the reservoirs. Nalcor considered that this measure would limit cumulative effects on forestry resources in the near-term since the total Allowable Annual Cut for that period would include the wood to be removed from the reservoirs.

Project Sequencing

Regardless of Project sequencing, the Project would result in the inundation and disturbance of the same extent of terrestrial habitat, which would still represent less than one percent of the size of Forest Management District 19A. Nalcor predicted that the effects of the Project on forestry would not change because of changes in Project sequencing.

8.5.2 Participants' Views

There is little commercial forestry harvesting taking place in the Project area according to the provincial Department of Natural Resources. Existing commitments to forest operators, granted prior to 2005, are in the order of 80,000 cubic metres. The latest Expression of Interest issued by the Province in 2010 would cover the remaining share of the Allowable Annual Cut for Forest Management District 19A (i.e. 120,000 cubic metres). Based on the current land base, the Department considered this amount to be a reasonable sustainable supply over a long-term period, long after the Project footprint would be cleared.

The Department agreed with Nalcor's conclusion that the Project would not have any noticeable effect on the Allowable Annual Cut because the total Project footprint would be small compared

to the total area of the District and other productive areas outside of the river valley would remain unaffected.

The Department stated that the Project would not entail regular commercial harvesting operations because it would be considered a reservoir clearing activity. As such, some of the harvesting guidelines described in the *Forestry Act* and under the District's Five-Year Operating Plan, such as planning for natural regeneration, would not be applicable to the Project. On the other hand, some of the ecological protective guidelines would have to be respected, including those related to the requirements to maintain fire equipment nearby. The Department expected to conduct full compliance monitoring in this respect and was confident that there would be minimal risk of fires related to harvesting operations. The possibility of forest fires is further discussed in Chapter 14.

Forest harvesting taking place outside of the flood zone, such as access roads and storage areas, would have to be done in accordance with all the requirements of the *Forestry Act* and the District's Five-Year Operating Plan.

The goal of the Department would be to maximize the volume of timber that would be harvested from the reservoirs. For areas that would not be cleared under Nalcor's preferred clearing option, the Department planned to obtain a commitment from Nalcor so other forest operators, if they wish, could have unrestricted access to those areas at the same time that harvesting is being completed by Nalcor. This measure would ensure a long-term supply of timber for the region, if there is a demand for it.

The Department also stated that timber clearing activities would be subject to royalties as per the provincial timber royalty regulations and that these royalties would be determined at a later time, prior to clearing commencing.

Innu Nation noted that Forest Management District 19A is located within the territory claimed by the Labrador Innu. An Interim Forest Agreement between Innu Nation and the Province was negotiated in 2003 to provide full participation by Innu Nation in management planning, information sharing, development of sustainable forestry practices and preparation of ecosystem-based management plans. An ecosystem-based management plan for Forest Management District 19A was completed in 2008.

Innu Nation considered that the partial clearing option favoured by Nalcor would not comply with the policy goals included in the management plan for Forest Management District 19A with respect to enhancing local economic benefits and minimizing merchantable wood wastage during timber harvesting operations. Innu Nation calculated that under Nalcor's preferred option, over 500,000 cubic metres of merchantable timber would be flooded, including some of the best wood in Labrador. Innu Nation suggested that the goals of the district's ecosystem-based management plan could be met if additional clearing was done.

Grand RiverKeeper Labrador Inc. considered that the current Annual Allowable Cut of 200,000 cubic metres was sufficient to support forestry operations in Labrador, either existing or proposed, and there was no need to allow additional timber harvesting, including from the Project. It also expressed concerns that should no market be found for the predicted 500,000 cubic metres of wood to be harvested from the reservoir, it would go to waste because reservoir clearing activities would not be stopped. On the whole, participants stated that Nalcor's preferred reservoir clearing strategy would waste forest resources.

8.6 OTHER RESOURCE-BASED ACTIVITIES

8.6.1 Nalcor's Views

Mining

Nalcor reported that the current focus for mining and exploration in Labrador is outside the Assessment area (Voisey's Bay for nickel and western Labrador for iron ore). Within the Assessment area, Nalcor noted that claims exist for uranium around Happy Valley-Goose Bay and in the Churchill River and for garnet, zircon and titanium-iron oxides in the Churchill River estuary. A series of contiguous individual claims also exist near Cache River. Nalcor concluded that no mineral claim would be affected by the Project.

Agriculture

A proposed agriculture development area of approximately 800 acres (324 hectares) along the Mud Lake Road would provide opportunities for agricultural expansion in the Assessment area. As of 2008, 50 acres had been cleared and an additional 20 acres had been cleared in other parts of Happy Valley-Goose Bay. Nalcor concluded that there would be no interaction between the Project and agricultural activities.

8.6.2 Participants Views

Mining

The Project would partially flood 38 individual mineral claims for blue marble on the Churchill River near Cache River. It was estimated that 20 percent of the strike line intersecting the various outcrops sampled so far would be flooded.

Agriculture

A participant expressed concerns that the Project would negatively affect groundwater quality in the area along the Mud Lake Road where agriculture is proposed. According to the provincial Department of Environment and Conservation, the Project would not likely affect groundwater. However, no specific data regarding groundwater and the suitability of this area for agricultural purposes were collected because this was not an issue identified by Nalcor.

Ecotourism

Some participants stated that the Project would prevent the development of an ecotourism industry on the Churchill River, which, according to Grand RiverKeeper Labrador Inc., could create local and long-term jobs and potentially add over \$3 million dollars per year to the local economy. The organization pointed out that operators currently have no incentive to promote the river as an ecotourism destination because of the possibility that the Project would proceed.

The provincial Department of Labrador and Aboriginal Affairs noted that limited opportunities for ecotourism currently exist in Labrador but there is room for expansion. The Department pointed out the need to balance industrial development with the desire to move forward with supporting an ecotourism industry.

The Town of North West River recommended that Nalcor set aside funding to develop ecotourism operations to compensate for the loss of trapping, hunting and fishing opportunities.

8.7 PANEL CONCLUSIONS AND RECOMMENDATIONS

In reaching its conclusions on land and resource use, the Panel considered the following factors to be particularly relevant:

- terrestrial habitat either side of the existing river would be permanently inundated;
- existing fish habitat would be altered or destroyed; new habitat would be created both incidentally and intentionally through physical compensation works and there would be a lengthy transitional period following impoundment during which water quality parameters would be altered and methylmercury concentrations in biota elevated;
- available information suggests that the area affected is used for a variety purposes but is currently not a prime area for land and resource use activities;
- Nalcor committed to prevent Project employees from conducting harvesting activities as a condition of employment;
- Nalcor's use of construction camps and transportation policies would reduce the incidence of in-migration but the population of Happy Valley-Goose Bay might still grow because of Project-related activity, potentially resulting in more harvesting pressure;
- the construction period or periods (depending on timing of the two phases) would create a measure of disturbance (human presence, forest clearing activity) that could disturb game;
- the operation period would involve minimal human presence and activity in most of the Project area;
- Nalcor has committed to decommission most new roads built for construction purposes to minimize increased access;
- the creation of the reservoirs would change the ice regime, which in turn would affect the formation of the ice bridge used by Mud Lake residents; and
- the new reservoirs would present new navigation challenges and some opportunities.

Hunting and Harvesting

The Panel considers that, while increased hunting pressure is often a concern when large industrial projects are developed in wilderness areas, this would likely not be a serious problem given Nalcor's plans to prevent employees from conducting harvesting activities and to decommission all but 15 to 30 kilometres of access roads. The Panel also notes that the Project area is not a prime area for these activities now. Nevertheless, the Panel considers that there would be some adverse effects for moose, small game and migratory birds hunting related to the loss of riparian wetland and upland habitat and possible loss of ashkui areas. Potential loss of wildlife would be balanced to a certain extent if mitigation measures to replace riparian habitat were successful.

With respect to caribou hunting, the Panel heard that hunters often take advantage of caribou being close to a community or in an accessible location, particularly close to the Trans Labrador Highway.

During the construction period, the Panel considers that the Project might cause a certain amount of disturbance to the George River herd, causing animals to avoid certain areas. While this would likely not affect the type of hunting involving more extended trips, it could affect opportunistic hunting. While this might cause hunters to have to adapt hunting strategies, the Panel is of the view that it would not be a prime factor in reducing overall hunting success.

During the operation period, the Panel considers that the Project would not likely affect the George River herd or hunting patterns. However, the Panel recognizes that there are legitimate

concerns about the future of the herd and the possible cumulative effect of a large number of small changes in the herd's total range.

Therefore, it would be important to monitor how the herd interacts with the Project and any changes caused by the Project to the way in which caribou is hunted in the area. For example, caribou hunting could be one of the parameters of importance to Aboriginal groups that the Panel is recommending should be considered in the design and implementation of Nalcor's proposed community-level land and resource use monitoring program (Recommendation 9.3).

As there is currently no legitimate hunting of the Red Wine Mountain caribou herd, and unlikely to be any for many years, there are no resource use issues relating to this herd.

The Panel also acknowledges that any loss of existing berry-picking areas would be offset by the likely creation of new areas under transmission lines. The use of these areas would depend on how accessible they were, the vegetation control measures used, and people's perceptions of how safe it would be to pick in these areas.

Fishing and seal hunting

Nalcor predicted considerable changes in habitat and water quality during a lengthy transition period following impoundment, and has indicated that these could affect the abundance of certain species. The Panel has determined there would be significant adverse environmental effects on fish habitat and fish assemblage (Chapter 6). This means that there is a substantial risk that certain species favoured for recreational fishing and for consumption may be less abundant in the reservoirs. Because of the loss of tributary microhabitats that could not successfully be recreated in the main stem, brook trout and ouananiche may be particularly vulnerable. Loss or decline of these species is by no means certain but there is considerable risk. However, some species, less favoured but also fished, could increase in numbers because of a predicted trophic surge.

The Panel also notes that inundation would bring the edge of the reservoirs somewhat closer to the Trans Labrador Highway. This, together with the effect caused by a modest increase in permanent roads in the area after construction, could increase access to fishing areas. This effect could be beneficial if fishing excursions were made easier, but adverse if increased fishing pressures affected the resource.

Nalcor indicated that consumption advisories would likely be required for fish caught in the reservoirs and could be extended as far as the Goose Bay estuary. For the main stem of the river, consumption advisories have been and are still in place to address methylmercury contamination caused by the Churchill Falls project. The Panel did not hear evidence of an active communications program beyond a sign posted at Lake Winokapau. The Panel observes that it appears likely that most people assume that all or most species in the river are still contaminated even though this is no longer the case. The Panel did not receive evidence indicating how the partial regulation of the river caused by the Churchill Falls project has affected the abundance of preferred fish species in the lower Churchill River, what level of fishing took place before the Churchill Falls project, or the extent to which existing methylmercury contamination has reduced fishing activity on the lower Churchill River.

Nalcor would monitor methylmercury levels in fish and seals in Lake Melville and the Panel concluded that there is a chance that advisories might be required in this area at some point. Even if methylmercury levels in fish found below Muskrat Falls do not require consumption advisories, the Panel also heard concerns that seals using this part of the river, as well as Goose Bay and the western end of Lake Melville, might still accumulate sufficient

methylmercury, which in combination with existing body burdens, might require a consumption advisory. Any advisories would be in place for decades. If there were a delay in Gull Island going forward, the area would be affected by advisories for an even longer period.

Nalcor also committed to an extensive fish habitat compensation plan, an extensive communication program to address consumption advisories (this would presumably include providing information to the public when advisories are lifted) and a ban on fishing by employees. The Panel also notes Innu Nation's recommendation to carry out fish habitat remediation or enhancement outside of the lower Churchill River watershed in order to compensate for the fact that there would be long-standing consumption advisories affecting fish in the Project area.

Overall, the Panel observes the following:

- the lengthy transition period following impoundment would affect the abundance of certain species in the river – some preferred species might increase in numbers because of changed conditions and increased food, others might decline because of changes in water quality, habitat, and predator-prey relationships;
- the nature of the final fish assemblage is still uncertain – some preferred species might not recover to previous numbers;
- while small numbers of people currently fish on the lower Churchill River, it is not certain to what extent this may be the result of changes caused by the development of Churchill Falls;
- the continuation of consumption advisories would continue to affect the actual and perceived acceptability and attraction of the lower Churchill River as a fishing destination; however, some people may be happy to continue fishing on a recreational basis, either practicing catch and release or monitoring their intake of fish; and
- there is still uncertainty about the potential for fish and seals in Goose Bay and Lake Melville to bioaccumulate levels of methylmercury that would necessitate consumption advisories.

The Panel acknowledges that, in the main stem of the river, the effect of mercury contamination leading to consumption advisories and a lack of confidence in the safety of fish might affect a relatively small number of people. The effect would still be adverse and would likely reduce options for fishing for a number of decades. The Panel acknowledges Nalcor's commitment to investigate remediation of the saltwater intrusion in Grand Lake as part of its fish compensation strategy. This could provide some additional fishing opportunities outside of the area that would be affected by mercury contamination. Recommendation 6.6 also addresses the possibility of undertaking other compensation works outside of the lower Churchill River watershed. The implications of consumption advisories in Goose Bay and Lake Melville on the traditional harvesting activities of Inuit are addressed specifically in Chapter 9.

The Panel concludes that the Project would have an adverse but not significant effect on fishing in the main stem of the Churchill River because this is not currently an important fishing destination. However, should new consumption advisories be required in Goose Bay and Lake Melville, the Project would have a significant adverse effect on fishing and seal hunting in this area because of the reliance by many Aboriginal and non-Aboriginal people on fish and seals caught there. It is uncertain whether consumption advisories would be required beyond the mouth of the Churchill River, and this uncertainty needs to be resolved before reservoir filling proceeds (see Recommendation 6.7 on the assessment of downstream effects).

Trapping

The Panel heard evidence that while historically people trapped extensively along the length of the Churchill River, there is no longer much trapping occurring in the Project area. Trapping is not currently constrained by the resource or by access to alternate suitable areas, and is more likely to take place in areas close to home communities, not requiring lengthy journeys. To the extent that people still trap along the river, their trapping areas would be lost and traditional knowledge of the specific area would no longer be useful. The Panel acknowledges that if riparian habitat could be successfully re-created along the shores of the reservoirs, this might provide some replacement trapping opportunities, but Nalcor's requirement to maintain the reservoirs at full supply level with limited drawdown suggests that the new riparian zone would be a narrower band.

Nalcor committed to compensate active trappers. However, the Panel observes that its proposed trapping compensation program may set the bar too high by requiring proof of ten years of continuous use because external factors may not have allowed trappers to operate consistently each year.

The Panel heard that many older trappers lost both equipment and their traditional trapping grounds as a result of the flooding of the Smallwood Reservoir. Nalcor has offered financial redress to Innu trappers through the *Tshash Petapen* Agreement, and also committed support to commemorate other Labrador trappers.

RECOMMENDATION 8.1 Trapping compensation program

The Panel recommends that, if the Project is approved, Nalcor be required to establish a compensation program for all bona fide trappers along the lower Churchill River, without requiring proof of ten years' use as an entry point. Instead, compensation should be commensurate with the total extent of trapping activity during the previous ten years, as shown by the recorded income attributable to the Project area. Compensation should be awarded within six months after an individual trapper has established eligibility.

The Panel concludes that, after the proposed mitigation, the Project would not have a significant adverse effect on current trapping activities, because there is limited trapping in the Project area, there are adequate alternative trapping opportunities outside of the Project area and the proposed compensation program would help any trappers who still use the Project area to re-establish traplines elsewhere.

Cabins

Nalcor indicated that owners of cabins in the flood zone have conditions in their leases that enable the Province to cancel the lease without compensation. However, Nalcor would consider compensation to these cabin owners on an individual basis. The Panel heard that there may be cabins in the area owned by Aboriginal persons and Chapter 9 addresses this issue. Nalcor indicated that disturbances to cabins outside of the flood zone would be temporary during the construction period. The Panel was not provided with enough information to conclude whether any legitimate non-Aboriginal cabin owners would be unfairly inconvenienced during either the construction or the operation period but observes that cabin-owners with a grievance would be able to access the Panel's recommended complaints resolution process (Recommendation 15.8).

The Panel concludes that there would not be a significant adverse effect on cabins and cabin owners after mitigation, provided that the complaints resolution process effectively addresses an appropriate range of adverse effects, including temporary disturbance during construction and

any permanent changes brought about as a result of the inundation, location of access roads or location of the transmission lines.

Winter Travel

Concern about possible adverse effects on existing winter travel would mainly apply to the Churchill River below Muskrat Falls – above Muskrat Falls the ice on the river is presently considered unreliable and Nalcor predicted that post-Project conditions would be safer and more reliable.

Nalcor predicted that the thickness and stability of the ice below Muskrat Falls would not change but that freeze-up would be delayed by two weeks. This delay could extend to three weeks at some time in the future when climate change effects are taken into consideration. Nalcor would monitor ice conditions and communicate this information to the public. The Panel notes that Mud Lake residents already effectively monitor ice conditions for their own purposes.

Mud Lake residents have challenged Nalcor's ice predictions. Increased difficulty in winter travel could make it difficult for some residents, especially Elders, to continue living in Mud Lake. If alternate access eventually had to be provided via the Trans Labrador Highway, this would significantly change the character of Mud Lake.

Nalcor predicted that upstream of Muskrat Falls, travel on the reservoirs would likely be safer. Innu Nation questioned this, suggesting that its members would not trust reservoir ice. However, the Panel assumes that land users would eventually likely gain confidence in the reliability of Nalcor's operating regime and in the safety of the ice. Although some participants also questioned safety of the ice on Lake Melville, the Panel has concluded that the Project is unlikely to have an adverse effect on ice in this area. However, ice conditions and the timing of freeze-up and break-up should be monitored.

As mitigation, Nalcor committed to provide alternate transportation for Mud Lake residents if adverse changes to winter travel conditions could be directly attributed to the Project. Otherwise, changes would likely be attributed to climate change and it would be the responsibility of the Province to take action as part of the provincial climate change adaptive program. The Panel remains unclear as to what this would involve and to what extent costs would be covered by the Province rather than the residents.

The Panel observes that uncertainty about the effects of the Project on the formation of the ice bridge, and uncertainty about how adverse changes would be mitigated and at whose expense, would be a destabilizing and stressful factor for the community of Mud Lake, especially given the fact that any changes to the ability of residents to cross the river would be permanent.

RECOMMENDATION 8.2 Mud Lake ice bridge mitigation

The Panel recommends that, if the Project is approved, Nalcor, the Government of Newfoundland and Labrador and the Mud Lake Improvement Committee negotiate an agreement to address how any future adverse changes to the ice bridge that would lengthen the existing period of time when residents are unable to cross the river by boat or snowmobile would be assessed and mitigated. Alternative transportation options should be provided if travel across the river is prevented during the freeze-up or break-up for periods in excess of two weeks. The selected solution should adequately meet the residents' needs for everyday and emergency travel and should respect the character of the community. Road access should not be imposed on the community as a solution to address ice bridge changes without its consent. The primary onus to cover the costs of

this mitigation should be placed on Nalcor. The agreement should also address the role of the Province in mitigating any cumulative effects caused by climate change.

Navigation

During construction, the Project would cause navigational inconveniences but would not seriously impede passage on the Churchill River. During impoundment, Nalcor would be recommending that people stay away from the reservoir areas and restricted flows could present a problem for Mud Lake residents needing to cross by boat. Nalcor has committed to mitigate this problem if required.

RECOMMENDATION 8.3 Navigation during impoundment

The Panel recommends that, if the Project is approved, Nalcor be required to develop a mitigation plan in consultation with the Mud Lake Improvement Committee to address temporary transportation difficulties during reservoir impoundment periods. If transportation is impeded, Nalcor should provide and pay for alternative transportation that minimizes inconvenience to the residents.

Muskrat Falls already presents a barrier to navigation by boats that cannot be portaged. The Gull Island dam would represent a new barrier across the river, however the Panel recognizes that the existing rapids are already a barrier to power boats.

Trees remaining in the stick-up zones would be a navigational hazard and would make access to the shorelines problematic – something particularly needed by canoes for safe passage. Nalcor predicted that trees would only remain standing before either being sheared off by ice or waves within two to three years or removed manually at some point after this. However, the Panel is not confident that all of the trees in the stick-up zones would be sheared off as quickly as predicted, or at a depth sufficient to allow safe passage by boats.

The Panel observes that, while the river would technically remain navigable by canoes, the reservoirs would offer a much less enjoyable canoeing experience, while perhaps being more amenable to power boats.

Downstream of Muskrat Falls, reduced upstream sediment inputs would change the riverbed morphology from a braided channel to a meandering deep main channel. Nalcor predicted that this would have no effect on navigation, however Mud Lake residents expect shifting sandbars and variable water depth causing navigational hazards and explained that their existing knowledge would be less useful.

The Panel was unable to determine whether the Project would cause navigational hazards downstream of Muskrat Falls but considers that Transport Canada should work closely with stakeholders and Nalcor to monitor the situation and provide navigational aids if required.

RECOMMENDATION 8.4 Lower Churchill navigation mitigation and monitoring plan

The Panel recommends that, if the Project is approved, Transport Canada require Nalcor to develop a mitigation and monitoring plan for each reservoir, in consultation with river users, to address navigation issues on the river, including both reservoirs and the downstream portion of the main stem. The plan would address (a) navigation issues during the construction and impoundment periods, (b) provision of boat launches and portages, (c) identification of areas that need to be cleared before impoundment to create safe shoreline access areas for small boats, (d) management of the stick-up zones, including how and when Nalcor would manually remove trees left standing three years after impoundment, (e) management of trash and debris in the reservoirs, (f) charts to

show navigational hazards, signage and information, and (g) monitoring and specific adaptive management measures to address any navigational problems downstream from Muskrat Falls.

Forestry

While the Project would result in the permanent removal of part of the local forestry resource base, the Panel concludes that the mitigation proposed by the provincial Department of Natural Resources (allocating the Allowable Annual Cut for Forest Management District 19A to the Project's flood zone) would minimize any problematic competition with forestry operations elsewhere. The Panel understands that there is currently minimal harvesting taking place, and that the main challenges facing the forestry industry in Labrador relate to markets and transportation rather than resource availability. To the extent that maximized utilization of the wood harvested from the flood zone helps to develop a more viable forestry industry in Labrador, the Project may in fact benefit the industry. The Panel concurs with the Department of Natural Resources that Nalcor should permit local forestry operators free access to areas of the flood zone that it does not plan to clear, in order to maximize the amount of wood salvaged during reservoir preparation.

RECOMMENDATION 8.5 Allowing local forestry operators to clear additional areas

The Panel recommends that, if the Project is approved, the provincial Department of Natural Resources require Nalcor to allow local forestry operators to clear timber from areas not otherwise scheduled to be cleared, provided they can demonstrate a safe approach. Nalcor should be required to pay the stumpage fees for the forestry operators salvaging the extra timber.

Other Resource-Based Industries

The Panel heard evidence or concerns relating to three other resource-based industries. The Project would have an effect on mineral claims that have been registered with respect to an area of unusual blue marble. The Project would remove access to part but not all of the resource. The Panel understands that there is a well-established process under the provincial regulatory mining regime through which Nalcor and the claim-holder could resolve this issue. This is therefore not an issue for the Panel.

With respect to possible effects of the Project on the recently established agricultural area along the Mud Lake Road, the Panel concludes that the Project is very unlikely to affect groundwater quality in this area.

The Panel heard that there was limited ecotourism activity on the lower Churchill River but there was potential for it to expand. The Panel concludes that the two reservoirs, while enabling different forms of travel by power boat, would not be conducive to the type of travel by canoe or raft most favoured by ecotourists, and that therefore the Project would foreclose opportunities for ecotourism on the river. However, the Panel also notes that other ecotourism opportunities abound in Labrador.

Benefits

The Panel concludes that the Project would only provide very modest benefits with respect to land and resource use. The Panel did not hear positive testimony from participants regarding new opportunities. Benefits might include some increase of access in the area via new permanent roads, and easier winter travel on the reservoirs – both of which would have the potential to improve access to resources, making hunting or fishing somewhat easier and

improving wilderness travel opportunities. However, with increased access can come problems with over-exploitation of the resource. There would also likely be a net gain in berry picking opportunities.

The Panel concludes that the Project would not have a significant adverse effect on land and resource use, with the exception of the potential effects on fishing and seal hunting in the Lake Melville area identified above.

9 CURRENT ABORIGINAL LAND AND RESOURCE USE FOR TRADITIONAL PURPOSES

Chapter 8 addresses the effects of the Project on land and resource use activities within the Project area for Aboriginal and non-Aboriginal land and resource users alike. The Panel's Terms of Reference also require it to consider the effects of any changes that the Project may cause in the environment on the current use of lands and resources for traditional purposes by Aboriginal persons. This Chapter addresses this aspect of the Panel's mandate in detail.

Complementary information received by the Panel in accordance with its mandate on Aboriginal rights and titles is summarized in Chapter 10.

9.1 NALCOR'S VIEWS

Nalcor concluded that, based on the information that was available and once proposed mitigation measures are applied, the Project would not likely result in significant adverse effects on the current use of land and resources by Aboriginal persons for traditional purposes. Nalcor also committed to continue to address information received with respect to land and resource use activities practiced in the Project area and make every effort to mitigate Project effects on these usages and ensure that they are protected.

Nalcor agreed that changes to access conditions resulting from the Project could affect Aboriginal land and resource use patterns, either by limiting access to traditional harvesting areas (due to flooding, unstable ice conditions or debris from shorelines, for example) or by facilitating access by other Aboriginal and non-Aboriginal land and resource users and increasing competition for resources. However, Nalcor was of the opinion that, in general, there would be no distinction in the effects of the Project on Aboriginal or non-Aboriginal land and resource users. For example, access restrictions at work sites during the construction period would be put in place to protect the safety of the public as a whole.

Labrador Innu

With respect to the Labrador Innu, Nalcor stated that their traditional lifestyle was considered in the negotiation of the Impacts and Benefits Agreement. Nalcor also addressed effects of the Project on vegetation, including berries and medicinal plants, fish, wildlife and bird species (and their habitat), the ability to sustain harvesting, the quality of country food and ambient conditions on the land. For example, Nalcor stated that traditional Innu harvesting areas and camps would not be affected by Project noise, except temporary noise from reservoir clearing activities. The Project has also been designed to minimize effects from noise and the presence of facilities on sites of spiritual and cultural importance for the Labrador Innu, including *Manitu-utshu*, the rock knoll at Muskrat Falls (sites of spiritual and cultural importance are discussed in Chapter 11). Nalcor committed to respect the cultural beliefs of Labrador Innu throughout Project implementation.

Nalcor concluded that all recommendations made by Innu Nation during the review process that fell within its mandate with respect to land and resource use and did not contravene Nalcor's final decision-making authority over the design, construction and operation of the Project were adequately addressed in the EIS and subsequent information requests. Some of these recommendations would also be addressed in the Impacts and Benefits Agreement with Innu Nation. Nalcor indicated that it would have continuing consultative obligations with Innu Nation

through Innu Nation's role in the ongoing environmental management of the Project, environmental monitoring and the application of funding under the Impacts and Benefits Agreement.

Labrador Inuit

Nalcor concluded that there would be no effect on current land and resource use for traditional purposes by the Labrador Inuit in any parts of the Assessment area, including the land and water covered by Schedule 12-E of the *Labrador Inuit Land Claims Agreement*. Nalcor disagreed with a recommendation made by the Nunatsiavut Government about the need to collect additional baseline information regarding land and resource use and implement an Inuit-specific monitoring program. However, Nalcor committed to conduct land and resource use monitoring at a community level. Respondents would be asked to identify their Aboriginal affiliation and Aboriginal organizations would be asked to encourage their members to participate.

Inuit-Metis

Nalcor concluded that no locations of current land and resource use for traditional purposes by Inuit-Metis appear to be within the Project footprint based on information available. Nalcor indicated that the information reviewed in preparation of the EIS and the Consultation Assessment Report included information presented by the NunatuKavut Community Council to the Panel during the public hearing related to trapping activities in the Churchill River valley occurring prior to the 1980s and up to 1994. Nalcor stated that its conclusions with respect to the location of current land and resource use for traditional purposes by Inuit-Metis were consistent with that information.

Quebec Aboriginal Groups

Based on the information available, the amount of which varied from group to group, Nalcor concluded that there was no continuous current occupation of the Project area by any of the Quebec Aboriginal groups and that evidence of current land and resource use for traditional purposes was restricted to intermittent harvesting adjacent to or immediately within the Project area. As a result, Nalcor stated that there would be no interaction between the Project and the traditional activities of the Innu of Pakua Shipu, Unamen Shipu, Nutashkuan, Ekuanitshit, Takuaiakan Uashat Mak Mani-Utenam and Matimekush—Lac John and the Naskapis of Kawawachikamach and that there would be no significant adverse effects on their traditional harvesting activities, if any, occurring within or adjacent to the Project area.

Ashkui

Ashkui are areas of open water used by Aboriginal persons for hunting waterfowl in late winter and early spring and trapping beaver, mink, marten, and otter. Hunting of larger wildlife, such as caribou and moose, may also occur because these animals use ashkui to cross watercourses when the ice is unsafe. Ashkui were identified at the mouths of the Cache and Pinus Rivers, at Muskrat Falls and at the outlet of Lake Winokapau, in addition to other confluences along the Churchill River.

Archaeological evidence and oral history have suggested that ashkui have been used as gathering sites for several generations and are a dominant aspect of the Labrador Innu society in particular. Nalcor reported that ashkui have been described by the Labrador Innu as "supermarkets and pharmacies".

According to Nalcor, the Project would likely result in the loss of some ashkui on the main stem of the lower Churchill River, but ashkui would continue to form at higher elevations. Mitigation measures to enhance fish habitat would also contribute to ashkui formation at selected deltas.

Other ashkui located in the lower Churchill River watershed beyond the reservoirs would remain available for use by wildlife and Aboriginal persons. As such, Nalcor submitted that any effects on current land and resource use for traditional purposes related to the use of ashkui would be minimal and localized and there would be sufficient ashkui remaining in the Assessment area for harvesting to continue at similar levels. Nalcor also committed to conduct an ice observation program that would include open water areas such as ashkui and to monitor ashkui utilization by waterfowl.

Medicinal Plants

Nalcor reported that Labrador Innu and Inuit-Métis collect plant species for medicinal purposes in or near the Project but information available at the time of the EIS did not indicate the importance and frequency of medicinal plant gathering activities. Nalcor estimated that approximately 14 percent of the total ecotype areas where medicinal plants can be found within the lower Churchill River valley would be flooded.

Nalcor concluded that alternate areas exist where similar ecotype habitat would remain and no single ecotype where medicinal plants can be found would be completely lost. Hence, habitat loss for medicinal plants would be localized and was not anticipated to be of sufficient scale or magnitude to cause a reduction in the level of medicinal plant gathering within the Assessment area.

Canada yew was identified as an important source of traditional medicine by Labrador Innu and Inuit-Metis. In Quebec, Canada yew is harvested commercially because of its pharmaceutical properties but commercial harvest is not possible in Labrador because of the plant's limited distribution. Reservoir impoundment would result in the inundation of three sites where Canada yew was recorded.

Nalcor proposed to re-locate these plants to an area above the future reservoir limits. It committed to identify potential sites for re-location and to conduct field visits to confirm suitability of these sites in collaboration with the Labrador Innu. Nalcor also committed to undertake a follow-up and monitoring program and to implement adaptive management measures as appropriate. Traditional Knowledge of the plant and of the area would be important components of this follow-up and monitoring plan.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to current Aboriginal land and resource use for traditional purposes included the following:

- engage in discussions with Aboriginal communities regarding any potentially adverse effects of the Project on their land and resource use for traditional purposes in the Project area and make every effort to mitigate Project effects on these usages and ensure that they are protected;
- contribute to ashkui formation at selected deltas through fish habitat enhancement measures;
- identify potential sites for re-location of Canada yew plants to be inundated and conduct field visits to confirm suitability of these sites in collaboration with the Labrador Innu;

- provide country food as part of the regular menu rotation at the accommodation complex;
- continue consultative obligations with Innu Nation through Innu Nation's role in the ongoing environmental management of the Project, environmental monitoring and the application of funding under the Impacts and Benefits Agreement;
- conduct an ice observation program that would include open water areas such as ashkui and monitor ashkui utilization by waterfowl;
- undertake a follow-up and monitoring program of relocated Canada yew plants considering Traditional Knowledge and implement adaptive management measures as appropriate; and
- conduct land and resource use monitoring on a community level using a survey in which respondents would be asked to identify their Aboriginal affiliation.

9.2 PARTICIPANTS' VIEWS

Labrador Innu

In his opening remarks at the hearing, Grand Chief Joseph Riche of Innu Nation emphasized the importance of sites throughout *Nitassinan* (Innu traditional territory) and along the *Mishta-Shipu* (Churchill River) as strong Innu identifiers:

They are reflections of who we are as a people. They are the places where we gave birth to our children. They are the places where we buried our dead. They are the places we told our stories, and held ceremonies and feasts to mark the changing of the seasons and the successes of the hunt. They are the places we inherited from our parents. They are the places which we will pass on to our children.

Several Labrador Innu participants told the Panel about their connections to the Churchill River through hunting and fishing, cabins and camps, travelling on the land, harvesting, gathering of country food and burial grounds.

A participant noted that the practice of traditional activities was a strong reflection of what it means to be "Innu" – something that only Innu can understand – and that, unlike in the community, there was no negative influence, such as drugs and alcohol, when one was on the land.

Some participants pointed to a decline in the practice of traditional activities in recent time, because of a lack of financial resources for example. In some cases, short-term recreational pursuits have replaced what was once a way of life.

Other participants expressed their opposition to the Project because it could further damage their territory and hinder the future practice of traditional activities. They deemed it important to continue to have opportunities to practice traditional activities, even if not as intensively as before, and maintaining the integrity of their traditional territory would be essential to that. While Labrador Innu do not frequent their traditional territory as much, a participant noted that the opportunity to go back should always be kept as a possibility.

Younger people also expressed their desire to retain the capacity to learn about their culture and traditions by practicing traditional activities and by going on the land and share stories, skills, and beliefs with Elders. Some participants suggested that financial benefits from the Project could be used to finance on-the-land youth programs. One participant stated that re-capturing traditional practices of the past could be difficult because the current generation has lost so much of the way of life of their Elders.

While some participants acknowledged that areas where traditional activities can be practiced would remain unaffected by the Project, Innu Nation estimated that the Project could lead to the permanent loss of three main areas of current land and resource use for traditional purposes located between Muskrat Falls and Gull Island: Lower Brook (*Kamitinishkau-shipiss*), Edward Brook (*Etuat-shipiss*) and from Edward Brook to Pinus River (*Uapushkakamau-shipu*). These losses could not be mitigated.

At Lower Brook, camps, harvesting sites for porcupine, beaver, snowshoe hare, partridge, ducks and geese and fish and a birthplace could be permanently lost.

Harvesting sites for beaver, ducks, geese, and fish were identified at the mouth of Edward Brook. This area is also immediately beside the location of a gathering place near the Trans Labrador Highway where some Innu from Sheshatshiu have cabins. There would be a high probability that this gathering place would be used at some point in the future, and that Innu who reside in this area, either at cabins or in tents during gatherings, would hunt, fish and collect berries in these surroundings.

Beaver and geese are harvested at various locations along the Churchill River between Edward Brook and Pinus River. However, Innu Nation acknowledged that flooding was unlikely to have a significant effect on Innu land and resource use at these locations because travelling and harvesting was reported to occur only sporadically.

Overall, Innu Nation recognized that there was not enough information concerning the post-flooding habitat characteristics of these areas to know with certainty whether or not they could remain sufficiently biologically productive to continue to support harvesting activities. Innu Nation also considered that continued accessibility to these areas would largely depend on the topography of post-flooding shorelines, of which only an approximate indication is available now. Furthermore, Innu Nation cautioned that current Innu land and resource use information collected for this environmental assessment was based on a limited sample of respondents and did not allow an analysis of the frequency of land and resource use in any of these areas. These areas may not necessarily be representative of all community harvesting activities.

The construction, operation, and maintenance of the proposed transmission lines between Muskrat Falls and Churchill Falls and associated access roads could also affect Innu land and resource use, including effects from noise, traffic and health and safety hazards. Several Innu have cabins along the Trans Labrador Highway, at locations very close to the existing right-of-way within which the proposed lines would be located. About 15 currently occupied cabins and camps were identified by Innu Nation as potentially affected.

Two berry picking locations used by Labrador Innu have also been identified along the proposed transmission lines. Innu Nation recommended that Nalcor's proposed vegetation management plan for the transmission lines include a community awareness program about the health risks of berry picking along transmission lines.

Innu Nation also stated that noise-related issues from construction-related activities and traffic along the Trans Labrador Highway near Muskrat Falls and the turn-off to Gull Island could also disturb Innu occupants of cabins located in these areas at certain times of the year and hours of the day.

In particular, Innu Nation considered that Nalcor underestimated the predicted truck traffic on the Trans Labrador Highway. In addition to material delivery and the transport of personnel, Innu Nation contended that Nalcor should have considered construction machinery traffic between borrow pits and construction sites and logging truck traffic to and from the reservoir.

clearing areas. All together, this increased traffic could negatively affect traditional Innu activities taking place along the Trans Labrador Highway, especially along the portion west of the Gull Island road which is currently unpaved.

Innu Nation recommended monitoring and managing construction-related activities and traffic to minimize noise and disturbance for Innu cabin owners. Dust control measures should also be devised for the unpaved section of the Trans Labrador Highway west of the Gull Island road junction, particularly near Labrador Innu cabins and camps.

With respect to access, Innu Nation noted that increased accessibility by road and water could be both beneficial and detrimental for Labrador Innu. On one hand, the new access roads would complement their increased reliance on road transportation to reach land and resource use areas. In addition, increased navigability, especially if Nalcor routinely clears tree debris that could pose navigational hazards, could also facilitate access to harvesting areas that are currently hard to reach due to major rapids in the river.

However, better access could also cause increased competition from non-Innu land users, as well as Aboriginal persons living in Quebec, especially those with interest in caribou, and increased pressure on resources. Labrador Innu may also choose not to make use of the reservoirs if they perceive increased health risks of eating fish and game with elevated methylmercury levels.

Innu Nation recommended that boat ramps be built and access to reservoirs be maintained in perpetuity only in areas where enhanced land use and occupancy by Aboriginal and non-Aboriginal land and resource users would not adversely affect the threatened Red Wine Mountain caribou.

Labrador Innu Elders expressed concerns about the potential flooding of Canada yew, even though none of the Elders consulted harvested Canada yew at the location to be flooded during the period from 1990 to 2010. Nonetheless, the potential destruction of Canada yew would be a significant adverse effect for Elders because of its rarity within Innu territory and the strong healing power attributed to it.

Innu Nation recognized the experimental nature of Nalcor's proposal to re-establish Canada yew given that little, if any, evidence exists concerning successful transplants of this species elsewhere in North America. In order to ensure that Nalcor's proposal would be viable and respectful of the cultural value attached to Canada yew, Innu Nation recommended to take some of the soil that the plants are currently growing in to the transplant locations, to try to transplant some of the Canada yew as soon as possible to see if it would grow in the new locations and to have Elders visit the proposed transplant locations.

Should the Project be approved, Innu Nation stated that it would be necessary to establish an adequate baseline of current land and resource use for traditional purposes as soon as possible if monitoring and follow-up are to be effective. Baseline data concerning the locations of cabins and camps, hunting, trapping, fishing and gathering areas, frequency of visits to camps and cabins, and amounts of country food harvested should be documented. For example, Innu Nation noted that its cabin database is currently incomplete and inaccurate and this would prevent effective mitigation and systematic monitoring of Project effects.

Innu Nation recommended that this baseline be created as part of a Nalcor-sponsored program to be negotiated and operated cooperatively with Innu Nation. Innu Nation also challenged Nalcor's assertion that monitoring of land and resource use in the Project area would be

adequately conducted by responsible federal and provincial authorities because governments do not generally involve themselves in the monitoring of Aboriginal land and resource use.

Labrador Inuit

Inuit participants expressed the continuing importance of practicing traditional activities. For example, Ms. Charlotte Wolfrey, quoting the word of Inuit activist Ms. Sheila-Watt Cloutier, said that:

The wisdom of the land and process of the hunt teaches young Inuit to be patient, courageous, tenacious, bold under pressure, reflective to withstand stress, to focus and carry out a plan to achieve a goal. These are qualities and skills Inuit need to survive and flourish in the modern world, as well as the world of our parents and grandparents.

Similarly, the continued availability of resources and the integrity of traditional activities are closely linked, according to participants, to Inuit health and well-being, as well as to culture and traditions.

Several Inuit participants told the Panel about their connections to the Lake Melville area through cabins and camps, birthplaces, harvesting of country food, ice fishing, seal harvesting and seasonal travel.

Some Inuit participants acknowledged that the Project would be located some distance away from their traditional territory, which extends from the east end of Lake Melville to the Atlantic coast. However, several Inuit participants from Rigolet and the Upper Lake Melville area strongly stressed the importance of Lake Melville and their fear that the Project would affect it, exacerbating the effects they observed following the development of Churchill Falls. These included increased salinity, change in ice patterns and changes in water levels affecting berries growing on the shorelines.

Ice travel on Lake Melville was reported to be closely linked to the practice of current land and resource use for traditional purposes, including by Inuit travelling between their cabins and Happy Valley-Goose Bay, North West River and Rigolet.

Some of the traditional land and resource activities currently practiced by Inuit, including Inuit living in the Upper Lake Melville area, occur on land and water included under Schedule 12-E of the *Labrador Inuit Land Claims Agreement*, an area located outside of the Labrador Inuit Settlement Area, but within which Inuit beneficiaries are able to exercise specific harvesting rights for wildlife, plant and migratory birds as though it was part of the Settlement Area. The Nunatsiavut Government and Inuit participants disagreed with Nalcor's conclusion that the Project would not affect current land and resource use for traditional purposes by Labrador Inuit in any part of the Assessment area, including the lands included in Schedule 12-E. They attributed this conclusion to Nalcor's refusal to acknowledge Inuit Traditional Knowledge and current and historic Inuit use of lands and waters and to fully consider Inuit species of interest beyond the mouth of the river, such as seal and birds.

In particular, the Nunatsiavut Government contended that Nalcor did not adequately consider the distinctiveness of how Labrador Inuit use land and resources and occupy their territory in comparison to other Aboriginal groups (both in the Upper Lake Melville area and downstream of Muskrat Falls). The Nunatsiavut Government considered that fishing and fish consumption, seal hunting and seal consumption and travel over the ice on Lake Melville would be adversely affected by the Project due to changes in downstream aquatic communities, accumulation of mercury in fish and seal, both real and anticipated, and increased uncertainty and risk from

changes in ice formation and break-up patterns resulting from impoundment and water flow management.

With respect to activities related to the harvest of country food, the Nunatsiavut Government emphasized how the Project could affect the quality of country food and influence harvesting practices, while at the same time acting cumulatively with other past and current projects, activities and environmental conditions that are already affecting the availability and accessibility of country food. For example, the decreasing availability of the George River caribou as a source of country food was reported to have led to an increased reliance on seal harvesting. On the other hand, record low levels of sea ice in recent years have compromised access to seal harvesting areas, a situation likely to be exacerbated in the future due to climate change. With respect to the Project, the Nunatsiavut Government contended that the Project would adversely affect the quality of the country food currently consumed by Inuit by causing elevated levels of methylmercury in the downstream aquatic environment.

In order to conduct a comprehensive assessment and subsequent monitoring of the effects of the Project on Inuit land and resource use, the Nunatsiavut Government recommended that Nalcor establish baseline conditions before Project construction begins, using Inuit-specific key indicators such as seal harvesting, fish harvesting, wildlife harvesting and ice travel (for the lower Churchill River, Lake Melville and Groswater Bay). The Nunatsiavut Government wished to be an equal partner in the design and implementation of such information gathering and research programs. Ideally, the Nunatsiavut Government would be given adequate funding by Nalcor to carry out this program directly. At the very least, the Nunatsiavut Government recommended that the Panel make full consultation with it on these matters a condition of approval for the Project.

Inuit-Metis

The NunatuKavut Community Council did not agree with Nalcor's conclusion that its members do not currently practice land and resource use activities within the Project area and submitted that this conclusion was based on deficient information.

In particular, the NunatuKavut Community Council disagreed with Nalcor's use of information contained in "Unveiling NunatuKavut", the document submitted by the NunatuKavut Community Council to governments in support of its land claim. The NunatuKavut Community Council noted that this document shows detailed current land and resource use information only for a case study area located in southern Labrador. Information related to land and resource use outside the case study area is only described in very general terms. Nevertheless, and contrary to Nalcor's conclusion, the NunatuKavut Community Council indicated that maps included in "Unveiling NunatuKavut", along with the limited research done for this environmental assessment, showed that harvesting activities continue to exist within the Project area and that Inuit-Metis have a strong spiritual attachment to the river.

Additional time and financial resources would have been necessary for the NunatuKavut Community Council to investigate more fully current land and resource use activities by Inuit-Metis in the Project area. For example, closer examination of land use surveys and map biographies conducted since 1979 could have provided relevant information on Traditional Knowledge, traplines, caribou hunting, caribou habitat and forest land use. For traplines in particular, the NunatuKavut Community Council considered that any data collected over the last 20 years on traditional traplines in the Churchill River valley would have been relevant to the present assessment because most Inuit-Metis trappers still use traditional traplines. It is also

legitimate to think that trappers would have been practicing a range of different land and resource use activities along the way in addition to trapping.

With respect specifically to caribou hunting, the NunatuKavut Community Council has also been issuing tags to its members and collecting return data for the Project area since 2004. It was pointed out that Nalcor did not include this source of information in its environmental assessment.

The NunatuKavut Community Council also reported that surveys conducted in 2004 resulted in the mapping of high intensity zones for berry picking, small game hunting and trapping centered on Muskrat Falls, Happy Valley-Goose Bay, North West River and an area located south of Grand Lake. The NunatuKavut Community Council assumed that land and resource use activities for traditional purposes recorded in 2004 were still persistent to the current day. Data from 2004 was the most current data available.

During these surveys, Inuit-Metis also identified Muskrat Falls as an area that should be protected from development. They reported that the site has spiritual and historic value because it was the first big portage for Inuit-Metis travelling into the interior.

The NunatuKavut Community Council concluded that available information sources at the time of the public hearing showed intense current land and resource use for traditional purposes in the Project area. It also stated that Nalcor had not sufficiently addressed the effects of the Project on fish and wildlife harvested by Inuit-Metis, including effects below Muskrat Falls and effects of the Project in combination with other projects and activities occurring in the area.

In response to Nalcor's lack of consideration of Inuit-Metis current land and resource use for traditional purposes in the area of the Project, the NunatuKavut Community Council recommended that approval of the Project be conditional on the consideration of land and resource use and occupancy by Inuit-Metis.

Innu of Pakua Shipu

The Council of the Innu of Pakua Shipu did not participate during the public hearing and did not provide information directly to the Panel. However, as part of the Community Engagement Agreement signed between Nalcor and Pakua Shipu, interviews with 22 community members were conducted to collect information related to current Aboriginal land and resource use for traditional purposes.

Community members indicated during these interviews that their land and resource use activities are currently more frequent along the coast of the Gulf of Saint Lawrence in summer and along the Saint Augustin River and Little Mecatina River and in some areas of Labrador south of Lake Melville, in winter. A decline in the practice of traditional activities throughout the territory and a concentrated pattern of land and resource use around the reserve were reported.

Among the areas of current land and resource use noted, those that are closest to the Project were around Dominion Lake (12 participants identified this location) and along the Trans Labrador Highway (one participant identified this location as a place to go hunting during the winter).

Community members also expressed concerns during these interviews that the Project would change their traditional way of life and resource harvesting patterns by affecting fish (through habitat destruction and increased level of methylmercury), animals (such as caribou, beaver, porcupine, duck and hare) and plants, and would modify eating habits by reducing the

availability of country food and limiting opportunities to share country food among community members. The Project was also expected to have a negative effect on the status of Elders by destroying their traditional territory and its resources.

Innu of Unamen Shipu

The Council of the Innu of Unamen Shipu stated that availability and accessibility of resources were the main factors dictating the areas both historically and currently used by the Innu of Unamen Shipu for subsistence, ceremonial and traditional purposes.

In addition to hunting caribou and ptarmigan in the northern portion of their traditional territory, in areas contiguous to the Project and along the Trans Labrador Highway, the Innu of Unamen Shipu harvested eggs and trapped beaver in the sector of Gull Island as recently as 2006. The Council of the Innu of Unamen Shipu noted an increased in caribou hunting in Labrador in 2009 and 2010. The Council of the Innu of Unamen Shipu considered that fauna and flora at these sites would be affected by the Project based on Nalcor's conclusions in the EIS.

With respect to the continuing role of land and resource use for traditional purposes in the life of community members, the Council of the Innu of Unamen Shipu noted that although some Innu recognized that they lost some of their knowledge associated with the area and abandoned their traditional way of life, harvesting continues to be a powerful identity marker. Maintaining access to the land and its resources was considered essential.

The Council of the Innu of Unamen Shipu contended that the lack of existing information regarding caribou mortality sources in Labrador made it impossible for Nalcor to determine what effects the Project may have on caribou and, consequently, caribou harvesting by the Innu. Caribou hunting plays a key role in Innu culture and is an important source of country food, the availability of which was stated to be very important given that store-bought food can be challenging to obtain in an isolated community like Unamen Shipu.

In addition to flooding and elevated methylmercury levels in the aquatic environment, surface disturbances, heavy use of the site by workers, use of heavy equipment and trucks, blasting and tree clearing could negatively affect caribou.

In recent years, community Elders and hunters observed that more caribou were moving southward towards Quebec, in an important hunting area closer to their community. The Council of the Innu of Unamen Shipu was of the opinion that telemetry tracking data reported by Nalcor in the EIS confirms what Elders and hunters have observed. Hunting caribou in this area is considered more economical and profitable for Innu hunters than having to reach hunting grounds further north in Labrador. Hence, the Council of the Innu of Unamen Shipu submitted that any effects on herds in Labrador (from the Project or from the Project in combination with other existing and future projects or activities) that could affect this southward movement of caribou would negatively affect its members' caribou hunting practices.

Innu of Nutashkuan

The Nutashkuan First Nation stated that its members engage in customs, practices, and traditions that are integral to their culture throughout their traditional territory, including in the territory affected by the Project. These activities include hunting, trapping, fishing and gathering for food and subsistence, social, ritualistic and commercial purposes (caribou, ptarmigan, porcupine and lake trout), use of watercourses and waterways, establishment of camps, shelters, caches and dwellings, practice of spiritual, religious and cultural traditions and ceremonies, including for burials, and intergenerational transfer of their culture and language.

The Labrador/Quebec border does not limit where the Innu of Nutashkuan practice their traditional activities. Among the locations they visited in recent years in and near the Project area were Long Lake, Churchill Falls, north of the Smallwood Reservoir and along the Churchill River between Happy Valley-Goose Bay and Churchill Falls.

The Nutashkuan First Nation acknowledged that it was difficult to demonstrate their presence within their traditional territory because the creation of reserves and the establishment of the Labrador/Quebec border limited their ability to travel across their territory as they used to do before, when they more easily could follow caribou herds over long distances. In the recent past, low-level military training and the enforcement of hunting regulations by Newfoundland and Labrador authorities also negatively affected their practice of traditional activities.

On the other hand, the agreement negotiated in 2008 between the Nutashkuan First Nation and Hydro-Quebec in the context of the Romaine hydroelectric project provided sufficient financial resources to allow greater use of their territory.

Nevertheless, the younger generation is not as knowledgeable about how to practice traditional activities and the Project would risk destroying the territory where these skills can be taught. The Nutashkuan First Nation already lacks financial resources to teach younger people about traditional skills and bring them on the land.

According to the Nutashkuan First Nation, the Project would negatively affect the traditional activities they are currently practicing by restricting the movements of its members across their traditional territory and by affecting fauna and flora important to Innu, including vulnerable species. Woodland caribou in particular was reported to be fundamental to the culture and identity of the Innu of Nutashkuan, not only for diet and subsistence purposes but activities surrounding the management of this species is considered integral to their distinctive culture.

The Nutashkuan First Nation considered that disturbances from the Project (and from the Project in combination with other existing and future projects or activities) would cause woodland caribou to move towards undisturbed areas, which in turn would shift hunting pressure towards areas that are currently heavily occupied by its members and members of other Aboriginal groups in Quebec. This would negatively affect their hunting success and threaten the sustainability of the species on which depends their traditional lifestyle.

Innu of Ekuanitshit

The traditional territory of the Innu of Ekuanitshit extends through the Labrador/Quebec peninsula, from the north shore of the Saint Lawrence River to the Churchill River watershed.

The Council of the Innu of Ekuanitshit acknowledged that land and resource use across the territory relevant to this Project diminished over time for a number of reasons, including the division of the territory in arbitrary administrative units, hunting prohibitions imposed by governments and the increased presence of non-Aboriginal people. Mandatory school attendance also prevented the current generation from going on the land as much as their predecessors and caused them to lose some of their traditional activities skills.

Nevertheless, the Innu from Ekuanitshit continue to occupy their territory and practice traditional activities, albeit at a reduced level. They also considered that their province of residence should not prevent them from continuing to travel into Labrador to hunt caribou. Family and social relationships between the various Innu groups established in Quebec and Labrador remain strong.

The Council of the Innu of Ekuanitshit made reference to sources of information that were not considered by Nalcor but which confirm their sustained current occupation, motivated by hunting, in a region overlapping with or adjoining the Project area. For example, the environmental assessment report for Phase 3 of the Trans Labrador Highway indicated that Innu from the Quebec's Lower North Shore use the Trans Labrador Highway to opportunistically harvest caribou, porcupine, beaver, ptarmigan and other species along the road.

With respect to caribou, the Council of the Innu of Ekuanitshit pointed out that the Newfoundland and Labrador Department of Environment and Conservation recommended coordinating efforts with both the Government of Quebec and the Innu from Quebec's Lower North Shore to develop a recovery strategy for woodland caribou in Labrador. The Council of the Innu of Ekuanitshit considered this recommendation a recognition by Newfoundland and Labrador of the Innu's continued interest in this species.

Since 2009, the continuation of caribou hunting activities in Labrador by the Innu of Ekuanitshit has been facilitated by the *Innu Aitun* Fund, a fund created as part of an agreement negotiated between the community and Hydro-Quebec for the Romaine hydroelectric project for the explicit objective of promoting territory use.

The Council of the Innu of Ekuanitshit did not provide detailed information to the Panel regarding the effects they expected from the Project on their current land and resource use activities because they considered that Nalcor did not fulfill its obligations to prepare the necessary detailed studies needed to adequately predict such effects, including effects on the Lac Joseph caribou herd.

Innu of Takuaikan Uashat mak Mani-utenam

The Innu Takuaikan Uashat mak Mani-utenam Band Council submitted that its members continue to hunt, trap, and gather resources for subsistence and utilitarian purposes, use the waterways for transportation and food, give names to locations and practice burials and other spiritual and cultural activities in the area that would be affected by the Project. Generations of Innu have depended on their traditional territory for survival and while the practice of traditional activities decreased in recent time, they continue to practice a traditional lifestyle, even if only during a short period of the year. Community hunts continue to promote the transfer of the Innu way of life and culture and these activities remain of critical importance to the Innu identity.

The number of community members who have had to face charges in Labrador related to caribou hunting demonstrates clearly according to the Innu Takuaikan Uashat mak Mani-utenam Band Council the extent of their current land and resource use for traditional purposes on land that would be affected by the Project.

The Innu Takuaikan Uashat mak Mani-utenam Band Council contested Nalcor's conclusion that the Project would have no significant adverse effect on its members' traditional harvesting activities. The Council and its members also expressed concerns that, should it proceed, the Project would aggravate adverse effects on land and resource use activities observed following the development of Churchill Falls.

For example, caribou harvesting was displaced when calving grounds were flooded. As a result, the Innu from Uashat were forced to hunt further east, in the region covered by this Project. This proved to be difficult, in part due to the influx of and conflicts with other Aboriginal and non-Aboriginal land and resource users. It also meant that they had to travel over greater distances or to areas that were more difficult to access.

The Innu Takuaikan Uashat mak Mani-utenam Band Council asserted that this environmental assessment should consider the adverse effects of the development of Churchill Falls and associated transmission lines on their traditional land and activities, as well as the cumulative effects of this Project in combination with the Churchill Falls facility and other existing and planned hydroelectric, mining and forestry projects in Labrador and Quebec because no such study has been done so far.

Naskapis of Kawawachikamach

Caribou from the George River herd has always been the primary resource harvested by the Naskapis and they have traditionally moved with the herd throughout its annual range. The Naskapi Nation of Kawawachikamach did not agree with Nalcor's conclusion that the Naskapis have abandoned their traditional activities within the Project area.

To the contrary, the Naskapis continue to follow the George River caribou herd throughout their traditional hunting grounds, from the Ungava Bay to the Churchill River. Harvesting levels may vary in the various parts of their traditional territory from year to year but would include the Project area if this is where the George River herd is found in any given year.

In addition to disturbing caribou, the Project could cause elevated methylmercury levels in certain species of fish. Given that caribou hunting is often accompanied by fishing and trapping along the way, the Naskapis contended that these activities would also be affected by the Project.

Innu of Matimekush-Lac John

Traditional activities, in particular caribou hunting, continue to be practiced on either side of the Labrador/Quebec border by the Innu of Matimekush-Lac John. Caribou is considered sacred and is an important source of country food.

The Innu of Matimekush-Lac John suffered losses as a result of the development of Churchill Falls. Families from Matimekush-Lac John that had traditional hunting territories and trapping grounds in this area saw their traditional territories flooded and were prevented from continuing to hunt, fish and trap within their family lots.

Additional industrial development on their traditional territories, such as this Project, would be directly linked to other existing and future projects or activities, such as mining developments, in and around Schefferville where they reside. These activities would also prevent future generations from benefiting from the wealth that being on the land can bring and from learning the traditional lifestyle of previous generations.

9.3 PANEL CONCLUSIONS AND RECOMMENDATIONS

In reaching its conclusions on current Aboriginal land and resource use for traditional purposes, the Panel considered the following factors to be particularly relevant:

- information related to experiences on the land shared with the Panel by some Aboriginal persons suggests that there has been some decline in the practice of traditional land and resource use practices in recent time;
- the intensity of traditional activities practiced within the Project area vary across the various Aboriginal groups, but the area does not appear to be a prime area for land and resource use activities, with mostly intermittent and sporadic use relative to other areas outside of the Assessment area;

- there are family and geographical connections between Innu living in Labrador and Innu living in Quebec;
- the absence of negotiated consultation agreements with certain Aboriginal groups led to the Panel receiving limited and imprecise information with respect to current Aboriginal land and resource use within the Project area;
- ashkui are important hunting areas for Aboriginal persons and participants expressed uncertainty that they would re-form after inundation as predicted by Nalcor; and
- any effects of the Project on current land and resource use would act cumulatively with the adverse effects resulting from the development of Churchill Falls on the traditional territories of the Labrador and Quebec Aboriginal groups.

The Panel heard from several Aboriginal participants about factors that have influenced the intensity and extent of traditional activities practices over time. Among those factors were a host of societal and economic changes that included mandatory school attendance, the preponderance of wage employment, decline in fur price, industrial development, the creation of reserves, the establishment of the Labrador/Quebec border, the imposition of harvesting regulations by government authorities and the increased presence of non-Aboriginal land and resource users. Taken together, these factors have made the procurement of natural resources by Aboriginal persons using traditional ways more difficult and have influenced where these activities have been taking place and under which conditions harvesting is occurring.

The Panel determined that for the purposes of its assessment, "current" land and resource use activities would be those practiced at some time during the previous twenty years. The Panel considers that this strikes a balance between ensuring a proper assessment of what is happening now in the Project area while still allowing Aboriginal participants to rely on the knowledge from their Elders when sharing with the Panel how they consider the Project would affect land and resource use for traditional purposes and their own values associated with it.

This definition of a timeframe related to current land and resource use for traditional purposes for the discussion and findings in this chapter does not apply to the Panel's obligation to report information received from Aboriginal groups regarding their Aboriginal rights and titles which is presented in Chapter 10.

Labrador Innu

The Panel notes that the Project would have an impact on the land and resource use activities of the Labrador Innu by flooding harvesting and camping areas, including ashkui locations. The Panel considers that the loss of harvesting territory and any impact on the availability and quality of country food is an adverse impact for Nalcor to address with Innu Nation.

However, the Panel also notes that the Project area covers only a small portion of the traditional territory of the Labrador Innu (*Nitassinan*). The Panel also observes that while the Churchill River valley was made more accessible by the completion of the Trans Labrador Highway and that the road is heavily used by Labrador Innu to reach portions of their traditional territory, current land and resource use by Innu for traditional purposes is not confined to the valley and any adverse effects determination must be tempered by the reality of this fact. Many land and resource use locations reported to be frequented by Labrador Innu outside of the Project area would also remain unaffected and accessible.

The Panel was not provided the content of the *Tshash Petapen* Agreement and as a result cannot comment on the adequacy of measures included in the Agreement to manage and mitigate effects of the Project on current land and resource use for traditional purposes by

Labrador Innu. While the Agreement is subject to ratification by a majority vote by the community, such a vote may or may not mean that all members of Innu Nation are satisfied that the Project would not adversely affect their land and resource use and activities, after taking into account Nalcor's proposed mitigation measures and terms of the Agreement.

For example, the Panel notes that Innu Nation reported that several Innu occupy cabins along the Trans Labrador Highway and other roads where Project-related traffic could occur. Considering the length of the construction period, the Panel considers it important that Nalcor address temporary disturbances that could be caused by the Project so that the integrity of experiences on the land can be preserved.

RECOMMENDATION 9.1 Noise and dust management

The Panel recommends that, if the Project is approved, and to avoid disturbance of persons carrying out traditional land and resource use activities, Nalcor be required to monitor and manage construction traffic and borrow pit activities to minimize dust problems, noise and sleeping disturbance for occupants of cabins and camps along the roads.

With respect to ashkui, the Panel concluded in Chapter 7 that it is uncertain that ashkui would re-form at the deltas of tributaries as predicted by Nalcor. The Panel considers that, while uncertain, any permanent loss of ashkui at their current locations at Cache River, Pinus River, Muskrat Falls and the outlet of Lake Winokapau would represent a social and cultural loss given their traditional importance to Aboriginal persons. Recommendation 7.10 addresses the need to monitor ashkui formation in the Project area and waterfowl adjustment to changes in the location and formation of ashkui.

With respect to medicinal plants, the Panel acknowledges that Nalcor committed to relocate Canada yew plants that would be permanently flooded as a result of the Project. Given that these plants have cultural significance to Aboriginal persons, the Panel considers such mitigation to be important.

RECOMMENDATION 9.2 Relocation of Canada yew

The Panel recommends that, if the Project is approved, Nalcor be required to collaborate with Innu Elders on where and how to relocate Canada yew plants, conduct regular field visits with Elders for assessment, and employ any adaptive management procedures required to maintain a stable population of the plant.

The Panel concludes that while the Project would permanently affect certain locations where Labrador Innu carry out land and resource use activities for traditional purposes, after implementation of the mitigation measures proposed by Nalcor and those recommended by the Panel, the impact on Labrador Innu land and resource use would be adverse but not significant.

Labrador Inuit

Inuit who presented to the Panel emphasized the effects that they believed the Project would have on their traditional land and resource use activities taking place downstream of the Assessment area, including in Lake Melville and on land and water within the Labrador Inuit Settlement Area and as identified in Schedule 12-E of the *Labrador Inuit Land Claim Agreement*. The Panel notes in particular that concerns associated with the possibility for the Project to lead to methylmercury contamination in the downstream environment is a direct

reflection of the importance attributed by Inuit participants to harvesting activities in that area for the continuation of their traditional lifestyle.

As indicated in Chapter 6, the Panel cannot conclude with complete certainty what the downstream ecological effects of the Project would be beyond the mouth of the Churchill River. In particular, with respect to mercury, the Panel concluded that Nalcor's assertion that there would be no measurable effect on levels of mercury had not been substantiated for the Goose Bay estuary and Lake Melville, two important Inuit harvesting areas for fish and seal that have never been subject to consumption advisories in the past.

The Panel concluded that there is a chance that consumption advisories for fish and seal might be required in Lake Melville. The Panel considers that if consumption advisories are required in Lake Melville, this would likely have a marked effect on the acceptability and attraction of Goose Bay and Lake Melville as harvesting locations for fish and seal. Even if no advisories are required, the Panel notes that reduced confidence in the safety of fish or seal meat would have a negative effect on traditional harvesting activities, especially as the recent decline of the George River caribou herd may cause residents to rely more heavily on seal meat as a source of protein. Fishing and seal harvesting activities could be displaced or reduced. This in turn could reduce the value and enjoyment of cabins on the shores of Lake Melville. Recommendation 6.7 addresses the importance of improving the reliability of predictions regarding the transport and fate of methylmercury in Goose Bay and Lake Melville prior to impoundment taking place.

The significance finding in Chapter 8 with respect to the Project's effect on fishing and seal hunting in Goose Bay and Lake Melville would apply to traditional harvesting activities by Labrador Inuit, including the harvesting of country food in this area should Project-related consumption advisories be required.

Inuit-Metis

The Panel recognizes that it received only limited information during the review process about current land and resource use activities for traditional purposes in the Project area by Inuit-Metis. While some efforts were achieved initially when the first phase of a consultation agreement to facilitate information gathering was agreed upon by the NunatuKavut Community Council and Nalcor, late participation of the NunatuKavut leadership in the public hearing due to their interlocutory injunction application limited their input into the review process. The Panel also recognizes that the NunatuKavut Community Council's lack of resources prevented it from submitting substantial information after it started participating in the public hearing. During the public hearing, most information was received from individual Inuit-Metis participants, rather than from the organization, and the Panel notes that affiliation of participants could not always be confirmed.

The Panel notes that the main land and resource use activity practiced by NunatuKavut members, which has persisted for two centuries, is trapping and measures considered to mitigate the effects of the Project on trapping activities and to compensate for losses of trapping income, property or equipments attributed to the Project (Recommendation 8.1) might be particularly relevant to Inuit-Metis trappers. The Panel also observes that many land and resource use locations reported to be frequented by Inuit-Metis are outside of the Project area and would remain unaffected and accessible.

Based on the information on current land and resource use identified through the environmental assessment process, there are uncertainties regarding the extent and locations of current land and resource use by the Inuit-Metis in the Project area. The Panel recognizes that additional information could be forthcoming during government consultations. To the extent that there are current uses in the Project area, the Panel concludes that the Project's impact on Inuit-Metis land and resource uses, after implementation of the mitigation measures proposed by Nalcor and those recommended by the Panel, would be adverse but not significant.

Quebec Aboriginal Groups

The Panel recognizes that it received only limited information during the review process regarding current land and resource use activities for traditional purposes in the Project area by Aboriginal persons living in Quebec. This was due to the fact that Nalcor and Aboriginal groups were unable to conclude consultation agreements, with the exception of the Council of the Innu of Pakua Shipu. In addition, time constraints during the hearing period did not allow the Panel to travel to each community in Quebec. Video conference sessions in each community were offered as an alternative, but all but one of the communities opted to send representatives to community hearing sessions held in Sept-Iles. The Panel also notes that the accuracy and completeness of the information provided by Nalcor was challenged by some of the Aboriginal groups.

The information received was mostly anecdotal and was provided with the understanding that it was incomplete, and that insufficient time and resources were available to provide a more complete picture. Nevertheless, the Panel recognizes the continued importance, common to all Aboriginal persons, of practicing activities within the entire extent of their traditional territory. The Panel also recognizes the un-acknowledged impacts the development of Churchill Falls had on the traditional territory of Aboriginal groups located in Quebec.

Many of the concerns heard about how the Project may affect traditional activities were related to caribou hunting. Some of the groups' use of the Churchill River valley seems to be driven mostly by the seasonal movements of caribou. However, it was not always possible for the Panel to distinguish between the various herds referenced by the different groups. As indicated in Chapter 7 and 8, the Panel concluded that the Project would not likely affect the George River herd or hunting patterns, but there was some uncertainty with respect to the determination of cumulative effects because of other factors that may have contributed to the recent decline in their numbers.

In addition to caribou hunting, the Panel understands that other current land and resource use activities by Aboriginal persons living in Quebec taking place in the Project area appears to be seasonal, sporadic and of short duration, including incidental harvesting along the Trans Labrador Highway.

The Panel also observes that many land and resource use locations reported to be frequented by Aboriginal persons living in Quebec are outside of the Project area and would remain unaffected and accessible.

Based on the information on current land and resource use identified through the environmental assessment process, there are uncertainties regarding the extent and locations of current land and resource use by Quebec Aboriginal groups in the Project area. The Panel recognizes that additional information could be forthcoming during government consultations. To the extent that there are current uses in the Project area, the Panel concludes that the Project's impact on Quebec Aboriginal land and resource uses, after implementation of the mitigation measures proposed by Nalcor and those recommended by the Panel, would be adverse but not significant.

Monitoring and Follow Up

The Panel recognizes that the decline in land and resource use activities for traditional purposes by Aboriginal persons in recent years may be attributed to several factors external to the Project. In the future, it might be difficult to determine the extent to which the Project might contribute to a continuing move away from traditional activities on the land, or might to a degree support traditional activities by providing financial resources to buy equipment or pay for travel into the country through wage employment, or in the case of Innu Nation, Impacts and Benefits Agreement payments. The Panel acknowledges Nalcor's commitment to conduct land and resource use monitoring on a community level.

RECOMMENDATION 9.3 Community level land and resource use monitoring

The Panel recommends that, if the Project is approved, Nalcor involve all Aboriginal groups in the design and implementation of its proposed community land and resource use monitoring program for the duration of the construction period to ensure that parameters of importance to these groups and Traditional Knowledge are included.

Benefits

Any Aboriginal people who would be employed with the Project would have additional financial resources, which could be directed to the practice of traditional land and resource use activities. In addition, the Panel considers that members of Innu Nation would have increased opportunity to practice traditional land and resource use activities if financial resources coming from the *Tshash Petapen* Agreement are applied to this purpose.

10 ABORIGINAL RIGHTS AND TITLES

The Panel's Terms of Reference require it to include in its report information provided by Aboriginal persons or groups related to the following:

- traditional uses and strength of claim as it relates to the potential environmental effects of the Project on recognized and asserted Aboriginal rights and titles; and
- any concerns related to potential impacts on asserted or established Aboriginal rights and titles.

However, the Panel does not have the mandate to make any determinations or interpretations related to the following:

- the validity or the strength of any Aboriginal group's claim to aboriginal rights and titles or treaty rights;
- the scope or nature of the Crown's duty to consult Aboriginal persons or groups;
- whether Canada or Newfoundland and Labrador has met its respective duty to consult and accommodate in respect of potential rights recognized and affirmed by s. 35 of the *Constitution Act, 1982*; and
- the scope, nature or meaning of the *Labrador Inuit Land Claims Agreement*.

In accordance with its mandate, the Panel invited Aboriginal persons or groups to submit information related to the nature and scope of potential or established Aboriginal rights or titles in the area of the Project, as well as information on the potential adverse impacts or potential infringement that the Project would have on asserted or established Aboriginal rights or titles. On February 15, 2010, the Panel issued letters to all Aboriginal groups to encourage their participation in providing this information. A similar letter was sent to them on December 3, 2010, also inviting them to provide this information prior to or during the public hearing. Finally, on February 11, 2011, the Panel invited Aboriginal groups to participate in the public hearing.

Information on Aboriginal rights and titles was received by the Panel through testimony during the public hearing and written submissions. A summary of that information is provided below. Appendix 7 contains a list of documents received from each Aboriginal group with information relative to their respective Aboriginal rights and title. In accordance with its mandate, the Panel did not come to any conclusions or make any recommendations with respect to this information.

Information received from Nalcor and various Aboriginal groups regarding land and resource use, including current Aboriginal land and resource use for traditional purposes, and related Project effects, as well as the Panel's conclusions and recommendations in this regard are presented in Chapters 8 and 9, respectively.

Innu Nation

Innu Nation stated that the Labrador Innu have exclusively occupied and used the Project area for longer than any other groups, as evidenced by the Innu's oral history, archaeological research and a review of historical documentation.

Innu Nation demonstrated the extent of its historic and contemporary land use and occupancy for the purpose of supporting the existence of un-extinguished Aboriginal rights and title in documentation provided under Canada's comprehensive land claims policy in 1977. This documentation was accepted for negotiation by both governments.

The Labrador Innu sustained losses to their traditional territory and lifestyle and their Aboriginal rights and title were negatively affected by previous industrial development, in particular the Churchill Falls development and hunting and firewood cutting regulations imposed by Newfoundland and Labrador. Nevertheless, the Labrador Innu continue to hold Aboriginal rights and title to the land and water involved in the Project and Innu Nation asserted that the negotiation of the *Tshash Petapen* Agreement with Nalcor and the Government of Newfoundland and Labrador was the continued recognition of these rights and title.

The *Tshash Petapen* Agreement contains provisions related to an Impacts and Benefits Agreement, redress with respect to the development of Churchill Falls and a bilateral land claim Agreement-in-Principle between Innu Nation and the Government of Newfoundland and Labrador. The land claim Agreement-in-Principle describes various categories of Innu lands that would be owned and administered by a future Innu Government or through co-management with the provincial and federal governments. Through cooperative arrangements with governments, the Labrador Innu have already gained control over fishery and forestry developments within their territory.

Innu Nation recognized that Nalcor consulted with it starting in 2000 for the purpose of identifying and seeking ways to address the adverse impacts of the Project on its Aboriginal rights and title. Furthermore, Innu Nation considered that the impacts of the Project on its rights and title would be positively addressed through the ratification and full implementation of the *Tshash Petapen* Agreement and its associated agreements. While the Project would result in the permanent loss of certain parts of its traditional territory, Innu Nation considered that the measures contained in these agreements, in addition to any other measures that may be recommended by the Panel and approved through further consultation and accommodation between Innu Nation and governments, would mitigate these adverse impacts.

Innu Nation cautioned the Panel against considering equally situations where the Project could have an impact on recognized Aboriginal rights and titles with circumstances in which rights and titles are only being asserted, with little evidence or support. For example, while Aboriginal persons living in Quebec have used the area of the Project in the past and wish to continue to be able to do so in the future, Innu Nation considered that the Project would not be located in an area of overlapping traditional territories between the Labrador Innu and Aboriginal persons living in Quebec. Similarly, the negotiation of a successful land claim, as considered in the *Tshash Petapen* Agreement, would also not negatively affect the rights and titles of Innu living in Quebec.

Innu Nation also considered that the NunatuKavut Community Council's claim that its members hold Aboriginal rights and title within the Project area above and beyond the rights and title held by the Labrador Innu was unsubstantiated. According to Innu Nation, the NunatuKavut Community Council was not able to establish that it represented Aboriginal persons who have lived in the area of the Project as an organized society since time immemorial, to the exclusion of others.

With respect to the Labrador Inuit, Innu Nation pointed out that some overlap of their traditional territories exists in the Lake Melville area. However, Innu Nation noted that it negotiated an overlap agreement with the Nunatsiavut Government in 2005, which expressly recognized that the Project would be within the exclusive territory of the Innu Nation. Innu Nation considered that additional consultation prior to Project approval between Nalcor, the provincial and federal governments and the Nunatsiavut Government, with the goal of implementing effective environmental management and mitigation measures, would adequately prevent land and water subject to the overlap agreement from being affected significantly and adversely by the Project.

Nunatsiavut Government

The *Labrador Inuit Land Claims Agreement* established Aboriginal rights and title for the Inuit over an area extending from northern Labrador to Lake Melville. In addition to Inuit living in the five communities of the Labrador Inuit Settlement Area, approximately 2,300 live in the Upper Lake Melville area.

Outside of the Labrador Inuit Settlement Area, many Inuit practice traditional activities on land and water included under Schedule 12-E of the *Labrador Inuit Land Claims Agreement*, an area composed of the entire Upper Lake Melville region and Grand Lake, within which Inuit may exercise specific harvesting rights as though it was part of their Settlement Area.

The Nunatsiavut Government acknowledged that the provisions related to Schedule 12-E are specific to harvesting and do not create, confer or establish any other Aboriginal rights to the Inuit. However, the Nunatsiavut Government asserted that the Project had the potential to affect Inuit harvesting activities on land and water included under Schedule 12-E, and therefore, should be assessed and mitigated with this in mind.

The Nunatsiavut Government submitted that Nalcor did not adequately incorporate the rights and concerns of Inuit living downstream of the Project into the environmental assessment because Inuit-specific valued environmental components and Inuit knowledge were omitted. Some of the potential impacts of the Project on the rights and title of the Labrador Inuit would be irreversible, could not be planned for, or could not be mitigated.

NunatuKavut Community Council

The NunatuKavut Community Council considered that its members hold Aboriginal rights and title relevant to this Project based on an unbroken peace and friendship treaty negotiated between the Inuit of Labrador and the British government in 1765. Based on this treaty, the NunatuKavut Community Council submitted three sets of information to the federal government in support of its comprehensive land claim, the latest of which was submitted in 2010. This submission ("Unveiling NunatuKavut") documented and illustrated present day rights and title held by the people descending from Inuit of South/Central Labrador based on historical, archaeological, anthropological and legal research.

The NunatuKavut Community Council stated that Inuit-Metis toponyms along the Churchill River and around Groswater Bay, Goose Bay and Lake Melville demonstrate the historic attachment of the Inuit-Metis for the area.

The NunatuKavut Community Council also considered that its asserted land claim had been neither adequately considered nor properly accommodated with respect to the potential impacts of the Project as opposed to the consultation and collaboration opportunities that were afforded to Innu Nation, which also holds an asserted (as opposed to established) land claim. The NunatuKavut Community Council also disagreed with Nalcor's position that a land claim accepted for negotiation by the federal government and participated in by the Province, such as that of Innu Nation, provided for a greater duty to consult and accommodate. The NunatuKavut Community Council stated that there is no legal difference in the nature of the Innu and NunatuKavut claims with respect to the obligation to assess fully the impacts of the Project on their rights and titles and to propose accommodation and impacts and benefits arrangements.

The NunatuKavut Community Council concluded that the only way to avoid the violation of Inuit-Metis rights in the area of the Project was for the Panel to recommend that its members'

Traditional Knowledge and land and resource use be considered fully before the Project can be approved.

Council of the Innu of Pakua Shipu

In joint comments with the Council of the Innu of Unamen Shipu on the EIS Guidelines, the Council of the Innu of Pakua Shipu stated that members of these two communities continue to frequent the area that would be affected by the Project and use its resources in a traditional way. They never surrendered their Aboriginal rights or titles to this area.

The Council of the Innu of Pakua Shipu did not provide any other information to the Panel relative to its Aboriginal rights and title.

Council of the Innu of Unamen Shipu

The Council of the Innu of Unamen Shipu felt that the Project, when considered in its entirety (generation and transmission), would be located within its traditional territory, which extends north of the Gulf of Saint Lawrence between the 50th and 53rd latitude north and the 59th and 62nd longitude west. This territory includes Dominion Lake and Guinness Lake, both located in an area adjacent to the Project. Areas near Sheshatshiu and North West River have also traditionally served as important supply sectors for the Innu of Unamen Shipu.

The exercise of traditional activities within this traditional territory is not static. The location of harvesting sites for example has varied historically based on transportation, abundance or scarcity of game, illness, famine or weather. Different sectors of the traditional territory would have been used at different times of the year. Advances in technology and the modern economy also brought changes to how traditional activities are practiced, but the Aboriginal rights of the Innu of Unamen Shipu followed these changes and have remained flexible to permit their evolution over time. The Council of the Innu of Unamen Shipu contended that its Aboriginal rights and title remain valid because its members still practice traditional activities to this day.

The development of Churchill Falls, the Labrador/Quebec border and the imposition of conservation measures and hunting prohibitions by the Government of Newfoundland and Labrador have already negatively affected its traditional territory in Labrador and infringed upon, but not extinguished, and caused prejudice to the rights of its members. The Council of the Innu of Unamen Shipu asserted that the Project would do the same, especially because it would adversely affect caribou. Caribou play a central role in the exercise of the Aboriginal rights of its members, including rights related to hunting, subsistence and spirituality.

In fact, the Council of the Innu of Unamen Shipu considered that its caribou hunting rights in Labrador were implicitly recognized by the Government of Newfoundland and Labrador when it entered into negotiation with Innu groups living in Quebec regarding the management of caribou herds (*Paix du caribou*). The Council of the Innu of Unamen Shipu was of the opinion that Newfoundland and Labrador had the obligation to propose mitigation and compensation measures to reasonably enable its members to continue to hunt caribou as they have always done in the area to be affected by the Project, and by the Project in combination with other existing and future projects or activities.

The Council of the Innu of Unamen Shipu also expressed concerns that the Project could lead to the loss and disturbance of trails, pathways and portage routes in the area of the Project, to mercury contamination and degradation of water quality and to the loss of medicinal and berry plants. Together, these negative impacts could affect the health and subsistence of the Innu of Unamen Shipu, as well as the physical and spiritual wellbeing of its members.

Overall, the Council of the Innu of Unamen Shipu submitted that the Project would adversely affect its rights and interests, including its right to control developments affecting it and its territory, to practice traditional and other economic activities freely, to conserve and protect the productive capacity of its territory and its resources, to protect its members' cultural heritage and traditional knowledge, to give free and informed consent prior to the approval of any development affecting its territory, and to be accommodated.

Innu of Nutashkuan

The Innu of Nutashkuan stated that its members have always practiced traditional activities in a vast area straddling the Labrador/Quebec border and they continue to occupy the entire territory relevant to the Project on a regular basis.

According to the Nutashkuan First Nation, the artificial groupings resulting from the creation of reserves in the mid-1900s on the Lower North Shore and in Labrador did not affect the customary pattern of occupation and use of its traditional territory. Its view was that its members should be able to exercise their constitutionally-protected Aboriginal rights throughout the Labrador/Quebec peninsula, regardless of their province of residence. In addition, the Nutashkuan First Nation stated that its Aboriginal rights should be protected, regardless of whether or not current occupancy can be proven.

The Innu of Nutashkuan's land claim, parts of which cover portions of its traditional territory located in Labrador, was accepted in 1979 by the federal government. However, the Government of Newfoundland and Labrador has not recognized this claim, in spite of its constitutional obligation to do so according to the Nutashkuan First Nation. As a result, Newfoundland and Labrador has not met its duty to consult and eventually accommodate the Innu of Nutashkuan. In 2004, the negotiating group to which the Nutashkuan First Nation belonged, the Mamuitun Tribal Council, signed an Agreement-In-Principle with Quebec and Canada that expressly excluded the portions of its traditional territory in Labrador.

Any impacts of the Project on its members' customs, practices and tradition, or on resources on which they depend, would infringe upon their Aboriginal rights, titles and interests, including by interfering with their distinctive society and culture, their spiritual and cultural ties to their traditional lands and their right to move about freely and to access all of their traditional lands.

In particular, adverse effects of the Project on woodland caribou would negatively affect the hunting rights of the Innus of Nutashkuan, the same way hunting restrictions and conservation measures imposed by Newfoundland of Labrador have affected its members.

The Nutashkuan First Nation considered that the only way of compensating for the adverse impacts, losses, or disturbances caused to its traditional territory and Aboriginal rights and title from the development of natural resources would be for its members to be able to benefit economically from these developments.

Council of the Innu of Ekuanitshit

The Council of the Innu of Ekuanitshit's land claim, parts of which cover portions of its traditional territory located in Labrador, was accepted by the federal government in 1979 based on its members traditional occupation and use of that territory from time immemorial. An agreement on a comprehensive approach to deal with land and financial issues with respect to its land claim was reached between Quebec, Canada and the negotiating group to which the Innu of Ekuanitshit belonged, the Mamu Pakatatau Mamit Assembly, in 2001. However, the negotiation process has been inactive since 2007.

The Council of the Innu of Ekuanitshit also noted the refusal by the Government of Newfoundland and Labrador to recognize its land claim because of its policy to address cross-boundary claims only after all claims to the same area by Aboriginal persons residing in Labrador have been resolved. The Council of the Innu of Ekuanitshit stated that this policy resulted in a disproportionate amount of resources provided to the Innu of Labrador for participating in the environmental assessment compared to other Aboriginal groups that may also be affected.

The Council of the Innu of Ekuanitshit also emphasized that the Innu of Ekuanitshit never surrendered or abandoned its Aboriginal rights and title to its traditional territory and modernity did not diminish its desire to maintain the integrity of its territory.

With respect to its historical occupation of the land that would be affected by the Project, the Council of the Innu of Ekuanitshit indicated that Nalcor's own historical and archaeological work uncovered intense use of the region by the Innu of Ekuanitshit in the 19th century, in particular in relation to the Winokapau trading post. During the 20th century, the Innu of Ekuanitshit, among them an Innu hunter named Mathieu Mestokosho, travelled between its community and Lake Winokapau and North West River to hunt, particularly caribou and porcupine, and trade fur during the fall and winter. The Council considered that Nalcor wrongly omitted to consider historical activities of the Innu of Ekuanitshit in the area that would be affected by the Project.

For example, the Council of the Innu of Ekuanitshit underlined the fact that the historical use of Muskrat Falls by the Innu of Ekuanitshit was so strong that the Innu of Sheshatshiu gave the name *Ekuanatshiu Ministuk* to one of the islands near Muskrat Falls that was their main campsite.

Ekuanitshit Elders also told the Panel about travelling by foot to Sheshatshiu with their parents when they were younger. They hunted and trapped along the way. They also told the Panel that they had to stop eating fish from the Churchill River because of elevated methylmercury levels following the development of Churchill Falls and they predicted that this Project would similarly negatively affect the environment.

Maps prepared in 1983, the date of the last scientific assessment of the occupation of the land by the Innu of Ekuanitshit, also showed regular seasonal travel routes to Lake Winokapau and North West River with camps near Muskrat Falls and Happy Valley-Goose Bay. These primary and secondary routes would have been used regularly at the time by community members to reach and circulate through their harvesting grounds.

The Council of the Innu of Ekuanitshit did not provide detailed information to the Panel regarding the impacts it expected from the Project on its members' Aboriginal rights and title because it considered that Nalcor did not fulfill its obligations to prepare the necessary studies needed to adequately predict such impacts and to initiate meaningful discussions with the community in order to understand its historical and contemporary activities.

Innu Takuaihan Uashat mak Mani-utenam Band Council

The Innu Takuaihan Uashat mak Mani-utenam Band Council stated that its members claim Aboriginal rights and title and treaty rights to an area that includes a substantial portion of Labrador. Their traditional territory, which is shared in part with the Innu of Matimekush-Lac John, extends from the Labrador/Quebec border to beyond 61st longitude west. Their land claim was accepted by the federal government in 1979 but was never recognized by the Government of Newfoundland and Labrador.

The Project and all its components, including transmission lines to the Island of Newfoundland, would be partly located within this traditional territory. This territory also includes the entire area of the Churchill Falls facility, including the transmission lines, and several mining and urban developments.

The Innu of Uashat have continuously maintained their customs, practices, and traditions within this territory since a period that predated contact with Europeans, without their rights and title never being extinguished. These customs, practices, and traditions include those related to hunting, fishing, trapping, gathering, subsistence and commercial harvesting, transportation, natural resource management and stewardship, toponymy, burials, cultural and spiritual practices and social governance.

The development of Churchill Falls adversely affected their rights and title. A number of community members shared with the Panel the losses they sustained as a result. Their opportunity to continue to practice traditional activities and maintain their cultural and family ties to the land was lost when their families' trapping lots were flooded. They feared that this Project too, because of its proximity, could further affect their families' trapping lots and continue to negatively affect their rights and title.

Past hydroelectric and mining developments also acted cumulatively to affect their rights and title by preventing them from occupying their traditional territory, putting greater pressures on resources on which they depend, disrupting caribou, causing land fragmentation and pollution and leading to the increased presence of non-Aboriginals. The Innu Takuaihan Uashat mak Mani-utenam Band Council objected to an additional hydroelectric development being allowed to proceed without the free and informed consent of its members and without addressing the impacts of past projects or activities on their rights and title to their satisfaction.

The Churchill River Water Management Agreement between Nalcor and Churchill Falls (Labrador) Company, which would necessarily tie the Project with the Churchill Falls project, would also adversely affect traditional lands within both the upper and lower Churchill River areas. Similarly, the signature of the *Tshash Petapen* Agreement would infringe upon constitutionally-protected Aboriginal rights, including economic, political, and environmental rights, and the historical interest of the Innu of Uashat on lands within Labrador.

The Innu Takuaihan Uashat mak Mani-utenam Band Council was not willing to share further information with the Panel concerning traditional lands, rights and title and potential impacts of the Project on these because it considered it was not consulted or accommodated adequately by Nalcor or the governments in respect of the Project. It remained open to establishing a dialogue with Nalcor and the governments to discuss and share information about these impacts once presented with an acceptable consultation and accommodation process.

Naskapi Nation of Kawawachikamach

The Naskapis assert Aboriginal rights in Labrador that were never extinguished through a treaty. According to the Naskapi Nation of Kawawachikamach, these rights, extending into the Project area, are the logical extension of the rights already granted to it in northern Quebec through the James Bay and Northern Quebec Agreement and the Northeastern Quebec Agreement. Although the Naskapis filed a land claim with Canada and Newfoundland and Labrador for the portions of its traditional territory that fell in Labrador, this claim has not been accepted for negotiation by either government yet.

The Naskapis were of the opinion that the recognition of rights is the responsibility of governments, not that of crown corporations. They considered that Nalcor did not have the

authority to reject their Aboriginal rights, including the right to continue to hunt caribou throughout their traditional hunting grounds, including the Project area, and to not consider how these rights would be affected by the Project.

The Naskapis also indicated that they did not have the financial resources to study the impacts the Project may have on their Aboriginal rights and title, including, without limitation, effects on migratory patterns of caribou, and effects on fish in the Churchill River. At the public hearing, the Naskapis responded favourably to an invitation by Nalcor to hold a workshop on caribou in the community because it would enable them to share how the Naskapis have historically traveled through and practiced harvesting activities in Labrador.

Innu Nation of Matimekush–Lac John

The Aboriginal rights and title that the Innu of Matimekush–Lac John are claiming over portions of Labrador were never abandoned or waived in any way. It was one of the nine Innu communities located in Quebec that submitted a comprehensive land claim in 1979, a portion of which was located in Labrador. However, the Government of Newfoundland and Labrador never responded to this claim and the Innu of Matimekush–Lac John were not part of the negotiating group that signed an Agreement-in-Principle with Quebec and Canada in 2004 based on this 1979 claim.

However, the Innu Nation of Matimekush–Lac John started comprehensive land negotiations in 2005 in collaboration with the Innu Takuaikan Uashat mal Mani-utenam Band Council for the recognition of its shared Aboriginal rights and title over its traditional territory, including the parts covered by the James Bay and Northern Quebec Agreement and in Labrador. As part of these negotiations, meetings were held with Innu Nation to settle land overlaps in Labrador between the various communities. However, these negotiations were suspended in 2008.

The Innu of Matimekush–Lac John considered that its Aboriginal rights and title would be affected if no agreement is negotiated between it and the Innu of Labrador before the *Tshash Petapen* Agreement comes into force because the overlapping traditional territory it shares with the Labrador Innu would not be recognized, in spite of anthropological and archaeological research proving otherwise. The Innu Nation of Matimekush–Lac John reported that provincial and federal representatives indicated in public meetings and in correspondence with the community, that the *Tshash Petapen* Agreement would not be finalized if an overlap agreement with Innu Nation was not signed.

The Innu of Matimekush–Lac John also considered the *Tshash Petapen* Agreement to be unfair, as it would address the losses sustained by the Innu of Labrador following the development of Churchill Falls but no similar compensation is being considered for the families from Matimekush–Lac John who also sustained losses.

The Innu Nation of Matimekush–Lac John also pointed out that the refusal by the Government of Newfoundland and Labrador to recognize the rights of Aboriginal communities in Quebec to areas in Labrador, already created conflicts and animosity with respect to cabins located in Labrador and caribou hunting. The imposition of the Labrador/Quebec border also arbitrarily split the traditional territories of several families.

The Innu Nation of Matimekush–Lac John submitted that the Project could result in the unjustified violation of its Aboriginal rights and title, and could have adverse impacts on its traditional territory and on the traditional lots of 12 families that it considered were located in the Project area. It also considered that Nalcor did not adequately take these adverse impacts into

account and did not meaningfully inform and consult with the Innus of Matimekush-Lac John. This should be remedied before the Project is allowed to proceed.

11 CULTURE AND HERITAGE

This chapter considers effects of the Project on historical and archaeological resources, sites of spiritual and cultural importance and changes to the river landscape.

11.1 NALCOR'S VIEWS

Historic and Archaeological Resources

Nalcor's assessment of the effects of the Project on historic and archaeological resources was limited to areas where Project features would cause physical disturbance.

The methodology used to assess the effects of the Project on historic and archaeological resources was reviewed and approved by the Provincial Archaeology Office. Nalcor conducted sampling to establish a representative set of historic and archaeological sites, recovered historic and archaeological artifacts, and implemented mitigation in order to protect and preserve these artifacts and the information they contain.

Locations with historic and archaeological potential were chosen for testing based on predictive modelling, potential mapping, ground checking, direct interviews, and proprietary land use information provided by Aboriginal groups. Nalcor reported that 85 percent of sites with high archaeological potential, such as river confluences, falls, rapids, and points of land, have been investigated to date. Historic and archaeological potential was also mapped to identify and predict where sites could be found in the future.

Between 1998 and 2008, Nalcor investigated 1,440 testing locations, both within and outside the Project footprint. Close to 43,000 test pits were excavated at these testing locations and over 350 sites were recorded. In addition, hundreds of contemporary sites were recorded. These sites, dating from after 1960, included campsites, tilts, traps, trails, cutting locations, boil-up sites and industrial sites. About a dozen trails were also recorded and documented along the Churchill River, mostly in conjunction with point features such as campsites. Given that use of these trails before 1960 has not been confirmed, they were not registered as historic or archaeological sites.

Within the Assessment area, Nalcor recorded 46 historic and archaeological sites, which consisted of 26 sites with pre-contact components, six historic tilts, 14 historic campsites and other indeterminate historic occupations, and two historic Hudson's Bay Company trading posts. Among these sites was the earliest site yet known in the Upper Lake Melville area. Together, they provide evidence that the lower Churchill River valley was used by humans as early as 4,500 years ago.

Half of these recorded sites were likely of Innu origin and the other half were likely of either Innu or Inuit-Metis origin. Cultural affiliation remains approximate in some cases because of similarities between ethnic markers.

Of the 46 recorded historic and archaeological sites, two sites were excavated already and no further mitigation would be necessary. Mitigation measures related to the collection, documentation and conservation of the remaining 44 sites would be completed prior to any Project-related ground disturbance. Of these, 40 sites would be lost due to reservoir preparation and impounding, two sites would be lost due to construction of Project infrastructure, and two sites could be disturbed and lost because of construction of the transmission lines, increased

access or shoreline erosion. Mitigation measures considered in Nalcor's Historic and Archaeological Resources Management Plan are consistent with the policy direction and guidelines of the provincial *Historic Resources Act*.

Nalcor also committed to implement a Contingency and Response Plan for Historic and Archaeological Resources. The plan would include awareness training for Project staff and outline procedures to follow if previously unknown historic or archaeological resources are discovered during construction. Nalcor considered that such a discovery would be unlikely. Aboriginal groups would be engaged in the mitigation, preservation, and documentation of any discoveries of previously unknown historic or archaeological resources, including the hiring of Aboriginal persons to carry out fieldwork and research.

Artifacts recovered to date by Nalcor's archaeologists have been transferred to the Provincial Archaeology Office. Nalcor was not involved in any discussion regarding the fate of these artifacts, but committed during the public hearing to engage with communities to develop ways to commemorate sites and artifacts, and to make information available to be displayed locally.

Nalcor also committed to make use of best practice archaeological interpretation and analysis methods. This could include radiocarbon dating and the compilation of available archival, informant, and land use data pertaining to sites such as historic trapper's tilts and contemporary harvesting and campsites.

Nalcor concluded that the residual effects on historic and archaeological resources would not be significant because the resources could be recovered, documented, preserved, and used for research, publication, public display, and other educational purposes. It would continue to develop and implement its proposed Historic and Archaeological Resources Management Plan through the detailed Project planning phase and until they had confirmed the footprint of all ancillary facilities.

Nalcor determined that cumulative effects on cultural heritage resources would be adverse, permanent and irreversible, but not significant. All projects or activities considered in the cumulative effects assessment would be subject to their own environment assessment and would have to meet the requirements of the provincial *Historic Resources Act*.

Project Sequencing

Nalcor stated that the effects of the Project on historic and archaeological resources would be similar regardless of Project sequencing. Although the width of the transmission lines' right-of-way would be wider in the event that Muskrat Falls is constructed first, the proposed corridor within which it would occur would be the same. This corridor already underwent a historic and archaeological resources assessment, in accordance with provincial guidelines, and was mapped for its archaeological potential. If Project-related ground disturbance occurs in high potential zones within the corridor, a historic resources overview assessment would be conducted prior to starting work.

Sites of Spiritual and Cultural Importance

The EIS identified two sites of spiritual and cultural importance to the Labrador Innu located within the Project footprint: the site of the last shaking tent ceremony that took place in 1969 (*Ushkan-shipiss*) and the rock knoll on the north side of Muskrat Falls (*Manitu-utshu*). The latter is believed by Innu to be the dwelling place of the giant otter or seal-like being known as *Uenitshikumishiteu* in the Labrador Innu mythology. A second site where a shaking tent

ceremony took place sometime before 1969 (*Tshiashku-nip*) was subsequently identified within the Project footprint near Muskrat Falls.

Newfoundland and Labrador Hydro, Nalcor's predecessor, sponsored a field trip in 2006 with a group of Sheshatshiu residents to the site of the last shaking tent ceremony. Testimonies about the site were recorded and audio-visual materials were archived with Innu Nation. Nalcor considered that commemoration and documentation of the ceremony was an adequate mitigation measure. The development of any further educational and cultural materials based on this documentation would be the responsibility of Innu Nation.

Interactions with the rock knoll were reduced to the extent possible through redesign of the Muskrat falls facility. An alternate layout was developed that considered the cultural and spiritual importance of the site along with technical and economic factors. Most construction activities would occur on the south side of the river and clearing activities and removal of weathered rock near the rock knoll would be kept to a minimum. This would substantially reduce noise disturbance at the rock knoll to about the level of a normal conversation. During operation, the only noise at the rock knoll would be incidental noise with no measurable effect. In response to a recommendation by Health Canada, Nalcor agreed to develop a community consultation program to inform the public about expected Project-related noise levels at potentially sensitive cultural sites. The Environmental Protection Plan for the Muskrat Falls construction site would also outline measures to reduce interaction with the rock knoll and to educate Project staff about its spiritual and cultural significance.

Nalcor indicated that it remains open to continuing discussion with Innu Nation and Innu Elders on ways to reduce Project effects on the rock knoll. Nalcor committed to respect the cultural beliefs of the Labrador Innu, including with respect to communicating with the beings living under the rock knoll to ask them not to retaliate in response to the Project, as recommended by Innu Elders. The Impacts and Benefits Agreement negotiated between Nalcor and Innu Nation would also include a provision regarding measures to identify Innu cultural and heritage sites.

River Landscape

Nalcor stated that the Project would have a small footprint (the total area of the Muskrat Falls and Gull Island reservoirs would be 314 square kilometres as opposed to nearly 7,000 square kilometres for the Smallwood Reservoir) and there would be no large storage capacity to hold back or change water flows. In addition, since approximately 70 percent of the river flow is already currently regulated, Nalcor stated that the Project would have only minimal incremental effect on flow patterns.

There would however be some localized effects on landscape features from reservoir preparation, site clearing and infrastructure construction activities. Some of these effects would only be temporary. For example, clear-cut areas would only be visible until impoundment occurs.

Following impoundment, some landscape landmarks would be lost, but Nalcor stated that the reservoirs would generally retain a natural appearance. Nalcor also concluded that the presence, operation, and maintenance of the hydroelectric generation facilities would alter the aesthetic quality of the environment and could change land and resource user's perception of the area and discourage continued use.

However, because the proposed drawdown of the reservoirs would be significantly smaller and less frequent than the drawdown in the Smallwood Reservoir, the Muskrat Falls and Gull Island reservoirs would not be ringed by a bare and unattractive rocky shoreline.

Nalcor committed to reduce adverse effects on landscape features during reservoir preparation by encouraging the development of shrubs and vegetation to mimic natural nearshore zones and by managing and removing timber debris and decaying vegetation. Ice and waves would also contribute to stabilizing shorelines quickly, within two to three years.

Project Sequencing

The transmission lines' right-of-way would be widened in the event that Muskrat Falls is constructed first. This would result in slight changes to the landscape. The towers between Gull Island and Churchill Falls would still be lattice steel-type towers and would be no higher than those described in the EIS. The tower height along the Muskrat Falls to Gull Island section would also remain the same as that described in the EIS.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to culture and heritage included the following:

- continue to identify historic sites through detailed Project planning and during the second phase of the historical resource assessment program;
- implement data recovery and field recording programs for 44 identified archaeological sites;
- use best practice archaeological interpretation and analysis methods when implementing mitigation measures, such as radio-carbon dating and the compilation of available archival, informant, and land use data;
- engage with communities to develop ways to commemorate sites and artifacts and to make historic information available to be displayed locally;
- implement a Contingency and Response Plan for Historic and Archaeological Resources outlining procedures to follow upon discovery of previously unknown historic and archaeological resources during construction;
- engage Aboriginal groups in the mitigation, preservation and documentation of any new discoveries of historical or archaeological resources, including the hiring of Aboriginal persons to carry out fieldwork and research;
- provide testimonies and audio-visual material to Innu Nation about a field trip with Innu Elders to *Ushkan-shipiss* (the site of the last shaking tent ceremony) for archiving and use by the community;
- reduce disturbance at *Manitu-utshu* (the rock knoll) through Project redesign, including developing an alternate layout and concentrating activities on the south side of the river;
- develop a community consultation program to inform the public about expected Project-related noise levels at potentially sensitive cultural sites;
- outline measures in the Environmental Protection Plan for the Muskrat Falls construction site to reduce interaction with the rock knoll and to educate Project staff about its spiritual and cultural significance;
- continue discussion with Innu Nation and Innu Elders on ways to reduce Project effects on the rock knoll;
- respect the cultural beliefs of the Labrador Innu, including communicating with the creatures living under the rock knoll to ask them not to retaliate in response to the Project;
- identify Innu cultural and heritage sites, in consultation with Innu Nation, as part of the implementation of the Impacts and Benefits Agreement;
- encourage the development of shrubs and vegetation to mimic natural nearshore zones;
- manage and remove timber debris from the reservoirs;

- implement a program to be approved by the Provincial Archaeology Office to recover historic and archaeological information through recording, analyzing, and interpreting; and
- compile information from monitoring programs for cultural and heritage resources and provide it annually to the Provincial Archaeology Office.

11.2 PARTICIPANTS' VIEWS

Historic and Archaeological Resources

The Department of Tourism, Culture, and Recreation confirmed that Nalcor complied with all regulatory requirements and predictive modelling of archaeological potential has been done to its satisfaction. The Department was consulted during the development of Nalcor's proposed mitigation measures and would continue to be involved.

In addition, the Department stated that it was confident that all archaeological sites would be thoroughly and adequately recorded and excavated if they are likely to be adversely affected by the Project. It would expect that contemporary ethnographic sites, such as Innu and Inuit-Metis campsites, traps and tilts, would also be recorded adequately. Full excavation and in-depth examination of these sites would be expected despite them not having the same legislative protection as historic and archaeological sites.

Officials from the Department of Tourism, Culture, and Recreation would visit the Project area from time to time to remain aware of Project work related to historical and archaeological resources. Any new information would be reviewed and investigated.

The Department noted that Nalcor would only be required to recover artifacts in the field and provide them to the Provincial Archaeology Office. However, Nalcor may decide to have a greater involvement in the analysis, interpretation, and dissemination of related information. The Provincial Archaeology Office might want to collect additional data and might provide funding to external researchers to enable further scientific examination. The Heritage Division of the Department of Tourism, Culture, and Recreation has responsibilities related to the commemoration and interpretation of recovered artifacts.

A participant recommended that Nalcor be directed to go beyond regulatory requirements for baseline studies and pre-construction mitigation related to historic and archaeological resources. For example, while pathways are not included under the mandate of the Provincial Archaeology Office because they are not tangible resources, Nalcor should consider them a heritage resource in their own right, not solely in combination with tangible resources such as campsites, and should document them accordingly within the Project footprint.

The participant also stated that Nalcor's evaluation of archaeological potential could be improved by conducting parallel assessment processes involving both its own archaeologists and Aboriginal groups. In northern Quebec, this method proved successful in obtaining a more representative sample of historic and archaeological resources in the study area.

While the number of pits dug by Nalcor to determine archaeological potential was high (close to 43,000), the participant stated that a larger number of pits may have been necessary for a Project area of this size. A better predictive model could decrease the risk of making costly discoveries of historic and archaeological resources during construction. In addition, Nalcor's proposed reliance on environmental monitors and contractors, who would have only basic training and awareness in archaeological resource identification, could lead to historic and archaeological resources being overlooked during construction.

Other participants reminded the Panel that sites and artifacts were lost as a result of the flooding for the Churchill Falls project, including trails, burial grounds, trapping and hunting equipment, tilts and portage routes. There was only minimal documentation and commemoration of these losses and no compensation was offered. Participants predicted that the same thing would happen in the lower Churchill River valley.

Participants recommended that investigation, documentation and commemoration of historic and archaeological resources be undertaken before flooding begins so that irreversible losses may be offset and ancestors of all origins and their harvesting heritage may be recognized and honoured. This work should be done respectfully and in collaboration with local populations. Local heritage organizations could benefit by receiving funding to undertake part of this work and to implement youth education programs.

The Town of North West River recommended that Nalcor establish a legacy fund to compensate the past losses of traditional trapping grounds and to recognize the local trapping heritage. Funds could be used for information programs, permanent displays, and a tourist kiosk at the rapids or in the town.

According to a participant, the involvement of Aboriginal communities in the preservation and documentation of cultural heritage resources would be essential because archaeologists and anthropologists are liable to make wrong interpretations if they disassociate themselves from Aboriginal cultures, including the importance of storytelling in these cultures.

Innu Nation identified four Innu birth sites and knew of two others somewhere along the Churchill River that could be directly affected by the Project. Innu Nation cautioned that additional burial sites could be encountered in the Project area due to a history of Innu presence, and mortality, throughout the territory during the pre-settlement period. One participant in Sheshatshiu mentioned that his family burial ground was located in an area near Muskrat Falls that would be flooded.

Sites of Spiritual and Cultural Importance

Innu Nation considered that Nalcor's mitigation with respect to the permanent flooding of *Ushkan-shipiss*, the site of the last shaking tent ceremony, was incomplete. The video material that was produced following the visit should be used to produce educational materials, while the witnesses to the event are still alive, to help fulfill the schools' requirement to make their curricula culturally relevant to the Labrador Innu.

With respect to *Manitu-utshu* (the rock knoll), Innu Elders maintained that there would be a high risk that the creatures living under the knoll would be disturbed by the Project, and could destroy the dam or seek retribution in other ways. It would be Nalcor's responsibility to avoid this by entering into communication with these creatures. Some Elders appeared willing to offer guidance on how to establish communication.

While recognising the efforts made to date by Nalcor to reduce interactions with the rock knoll through Project redesign and development of an alternate layout, Innu Nation questioned Nalcor's conclusion that it would not be technically or economically feasible to re-route the transmission line corridor at Muskrat Falls to avoid the knoll completely. In the opinion of Innu Nation, the required span over the river would be no greater than that of many other river crossings throughout Canada.

Finally, Innu Nation asserted that the disappearance of six Innu place names associated with features that would be permanently flooded, as well as the potential imposition of non-Innu

place names for the new reservoirs and other Project or geographical features, would represent a permanent loss of Innu cultural heritage. The attribution of place names relevant to the Innu would compensate for the loss of Innu toponyms, both as a result of this Project and as a result of the development of Churchill Falls, and would help commemorate the generations of Innu people who have used and occupied the river valley.

River Landscape

Many participants spoke to a sense of loss associated with the permanent conversion of the Churchill River between Churchill Falls and Muskrat Falls into two large reservoirs. Participants highlighted elements of the river valley that were negatively affected following the development of Churchill Falls, including shorelines gouged by ice, erosion slumps on the riverbanks and disappearance of riparian habitats. Participants also mentioned that the flooding at Churchill Falls caused the loss of landscape landmarks familiar to those who had travelled extensively in the region prior to the development.

Participants predicted that the landscape in the river valley would continue to lose aesthetic quality if the flowing river is converted into two reservoirs.

Grand RiverKeeper Labrador Inc. advocated for the Churchill River to be designated a *heritage river* under the Canadian heritage river program to protect its natural and cultural features, ensure a more acceptable alternative future use, such as ecotourism, and to complement the designation of the Mealy Mountain National Park. The provincial Department of Environment and Conservation noted that a designation under the Canadian heritage river program was not a formal legislated protection mechanism but rather a stewardship initiative requiring the support and involvement of all interested stakeholders. A heritage river could be designated because of its natural features or cultural significance and a proposal would have to come from the provincial government. However, resources have not been made available for the Province to complete an assessment of rivers in Labrador that could be suitable for heritage designation.

11.3 PANEL CONCLUSIONS AND RECOMMENDATIONS

In reaching its conclusion on Culture and Heritage, the Panel considered the following factors to be particularly relevant:

- inundating the Churchill River valley would lead to the loss and disturbance of sites and artifacts of historic, archaeological, spiritual and cultural importance and would also affect intangible aspects of the river related to the use, meaning and attachment attributed to the Churchill River and surroundings by local residents and Aboriginal persons;
- local residents, including members of Aboriginal groups, have indicated that they have a deep emotional connection with the Churchill River;
- Innu Elders indicated that building the dam at *Manitu-utshu* (the rock knoll) would be disrespectful to the creatures living under it but that communicating with them may appease them;
- Nalcor was required to follow the requirements of the provincial *Historic Resources Act* and the Provincial Archaeology Office reviewed Nalcor's methodology and procedures;
- sites, artifacts and intangible aspects of the river that could be affected by the Project are of diverse origins and have been attributed to the various groups that participated in the review process;
- participants in both Labrador and Quebec noted the existence of burial sites within and near the Project area; and

- descendants of trappers wish to commemorate their trapping heritage, including by marking the losses sustained by the creation of the Smallwood Reservoir, among other measures.

The Panel notes that Nalcor would be obliged to continue to work closely with the Provincial Archaeology Office in completing its work on historic and archaeological resources should the Project receive approval and has committed to implement a program to recover information and artifacts from sites through recording, analyzing and interpretation. The Panel also notes that Nalcor would have to consult with the Provincial Archaeology Office and obtain approval for all proposed mitigation measures relating to historic and archaeological resources before proceeding with construction. However, the Panel considers that Nalcor should not only meet, and where appropriate exceed, regulatory standards related to the management and protection of historic and archaeological resources, but should also work in close collaboration with local communities and Aboriginal groups to recover, preserve, document and commemorate sites and artifacts of historical and cultural importance that could otherwise be irreversibly lost because of the Project.

The Panel recognizes the value of including all affected groups in searching for, documenting and commemorating historic and archaeological resources and the importance of respecting the deep emotional, cultural and spiritual connection that local residents of all origins have for the Churchill River. Nalcor's mitigation program should address both tangible heritage resources (sites and artifacts) and intangible resources (stories and knowledge). Nalcor should be required to implement all monitoring commitments related to cultural and heritage information made during the course of the environmental assessment process. In addition, Aboriginal groups should be kept informed of the work to be undertaken by Nalcor throughout Project construction and operation.

RECOMMENDATION 11.1 Involvement of Aboriginal groups in the management and protection of historic and archaeological resources

The Panel recommends that, if the Project is approved, Nalcor, in collaboration with the Provincial Archaeology Office, establish and support a program to involve all three Labrador Aboriginal groups in (a) the documentation and interpretation of known historic and archaeological sites and artifacts and (b) the process to be followed in the case of inadvertent discoveries of previously unknown sites and artifacts during construction, including notification of the three groups. Nalcor should also give consideration to inviting participation by interested Aboriginal communities in Quebec. Nalcor should share with Aboriginal groups the results of its work on the monitoring of historic and archaeological resources to be compiled and provided annually to the Provincial Archaeology Office.

The Panel notes that the creation of the Smallwood Reservoir resulted in the loss of culturally and historically important sites and artifacts, with no consultation, acknowledgement or commemoration, and this is still seen as an injustice by local residents. The Panel recognizes that Nalcor has been approaching the possible development of the Lower Churchill Project in a very different way and acknowledges the survey work already carried out and Nalcor's commitments made during the public hearing to engage with communities to develop ways to commemorate sites and artifacts of historic and cultural importance and to make historic and archaeological information available to be displayed locally.

RECOMMENDATION 11.2 Commemoration initiatives

The Panel recommends that, if the Project is approved, Nalcor work in collaboration with local communities and Aboriginal groups to (a) identify sites, artifacts and intangible elements (including portages, traplines, trails and personal stories) to be documented and commemorated, (b) determine how commemoration should occur and (c) implement

specific commemorative initiatives (such as plaques and story boards) at appropriate locations in communities and throughout the river valley. Local heritage organizations could benefit by receiving funding to undertake part of this work and to implement education and interpretation programs.

The Panel acknowledges the importance of recognising, accepting and respecting the cultural beliefs of the communities to be affected by the Project. The Panel notes the importance attributed to animal spirits by Innu Elders and the significance of these beliefs in the Elders' own past, present and future understanding and perception of the world and the environment in which the Project would take place, as well as in the values transmitted across generations. The Panel notes the qualities attributed by Innu Elders to *Uenitshikumishiteu*, the creatures living under *Manitu-utshu* (the rock knoll) at Muskrat Falls.

The Panel also acknowledges the mitigation carried out with respect to the potential inundation of the shaking tent ceremony locations, and Nalcor's commitment to engage with the animal masters as recommended by Innu Elders. Although the Panel does not know the content of the *Tshash Petapen* Agreement, it expects that it may contain provisions to allow and encourage further discussion between Innu Nation and Nalcor with respect to cultural concerns identified by the Elders.

With respect to the rock knoll, the Panel notes that Innu Nation questioned Nalcor's conclusion that it would not be technically or economically feasible to route the transmission line corridor completely away from the knoll. The Panel considers that this is an issue that should be further discussed between Nalcor and Innu Nation.

Innu Nation also raised the issue of place names – the loss of landscape features and their names through reservoir creation and the importance of cultural awareness when naming new landscape entities. The Panel understands that the allocation of new toponyms is a provincial responsibility and would encourage the Province to recognize the importance of place names in Aboriginal cultures.

RECOMMENDATION 11.3 Naming of Project-related features

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador develop an approach to the naming of Project-related features in consultation with local communities and Aboriginal groups that recognizes the importance of place names in Aboriginal cultures.

The Panel heard many participants address different aspects of a Project impact that the Panel (together with some participants) is calling "loss of the river". The Panel acknowledges that the lower Churchill River, if the Project were to be constructed, would continue to flow and would indeed appear relatively unchanged below Muskrat Falls, so – in a literal sense – the river would not be lost. However, the sense of loss associated with the conversion of substantial stretches of the river into reservoirs had a number of dimensions, felt in different ways by different people, some of whom told the Panel that they travelled the river more or less frequently and were familiar with its features, and others whose connection to the river was dependent on family, community or cultural connotations rather than active use. Thus the concept of "loss of the river" encompasses for the Panel several different elements related to both culture and heritage and land and resource use (as discussed in this chapter and in Chapters 8 and 9):

- **Change of the river landscape** – even though the new reservoirs would still form a landscape that would be natural in appearance except where the dams are visible, valued river features would disappear, including fast flowing water, rapids and falls, shallow delta areas, islands, varying water levels and associated river shorelines. Landscape changes

were also identified by some participants as being closely linked to the change in navigability by canoe. While canoe travel on the reservoirs would still be possible, the experience would be significantly different and likely to deter most canoeists.

- **Cultural connection** – the river was valued for the history and cultural significance it embodies, as a major travel route enabling both Aboriginal and non-Aboriginal people to access the resources of the land and pursue their traditional way of life.
- **Family connection** – participants spoke about parents, grandparents or other relatives travelling the river. In a few cases they referred to family members who had been lost in the river or were buried somewhere in the river valley.

The Panel recognizes that "loss of the river" would be felt most keenly by those individuals who travel the river or have travelled it in the past. The Panel also acknowledges that such a loss could be felt by people who would not travel the river but would place high value on knowing that the river, with all its various connections and meanings, remains unchanged. The Churchill River is by far the largest river in Labrador and as such has qualities not duplicated by other rivers.

The Panel also observes that both information gathered by Nalcor in the EIS and evidence presented at the public hearing shows that many residents primarily use other areas of Upper Lake Melville and beyond for the purposes of recreation, hunting and fishing and other traditional pursuits.

With respect to generational effects, it is difficult for the Panel to draw conclusions because few young people participated directly in the review process. While it was evident from those who did participate, and from older participants as well, that they would feel the "loss of the river" keenly, it is not possible to determine the extent to which this adverse Project effect would diminish over time for succeeding generations. The Panel notes that the oral tradition of affected Aboriginal communities would likely result in the feelings of Elders being passed on to future generations.

In reaching a conclusion about the significance of residual effects on culture and heritage, the Panel recognizes that Nalcor has been proactive in surveying for historic and archaeological potential, has been meeting all legislated requirements for the management and protection of historic and archaeological resources and has worked extensively with Innu Elders to address some of their cultural concerns. The Panel considers Nalcor's proposed mitigation program to recover, preserve and document cultural material to be reasonable and likely to be effective in part. However, the Panel also considers it unlikely that all sites and artifacts of cultural importance or meaning would be located and that flooding of such an area would probably entail a degree of loss of the potential to learn more about earlier peoples and cultures. The Panel recognizes that the Project itself would enable considerable investigation that might otherwise not happen.

The Panel also recognizes that for many people, the transformation of the river into reservoirs and the flooding of its original shorelines, travelled over hundreds of years by Canada's first peoples and subsequently by settlers and their families, constitutes a loss that cannot be mitigated, and one that is additive to the losses incurred when the Churchill Falls project flooded many lakes and waterways to create the Smallwood Reservoir.

While the Panel does not believe that the "loss of the river" could be directly mitigated, the Panel observes that should a decision be made to approve the Project, there are certain steps that may eventually help to offset some of the feeling of loss felt by some participants, including:

- acknowledgement of the significance of the change;

- ongoing respect for and protection of the ecological functions of the river as being at least equally important as the production of power; and
- willingness to address the protection of other rivers of natural and cultural significance in Labrador.

The Panel notes that Nalcor acknowledged the residents' strong attachment to the river in its closing remarks. The Panel's Recommendations 6.2 regarding environmental flow standards and 16.2 regarding protected areas would help address the other two points.

The Panel also observes that if only one of the two generating facilities were to be built, either Muskrat Falls by itself or Gull Island by itself, the "loss of the river" would be mitigated to a certain extent. For some, the presence of a dam anywhere on the lower Churchill River would likely represent a negative intrusion on the river; for others, a single dam, leaving more of the river in a natural state, might be seen as more acceptable. However, this issue was not discussed during the review.

The Panel concludes that the Project would cause a significant adverse effect to culture and heritage after mitigation particularly with respect to the "loss of the river" as a highly valued cultural and spiritual landscape. This effect would apply to a large proportion of the river between Churchill Falls and Goose Bay would be irreversible and would last for the duration of the Project.

Benefits

The Project would have benefits associated with the resources applied to studying, identifying and documenting historic and archaeological sites and artifacts. It is likely that the Project would result in increased knowledge of the uses of the river valley over time and would provide opportunities for Aboriginal persons to obtain training and experience in archaeology.

12 ECONOMY, EMPLOYMENT, AND BUSINESS

This chapter considers potential economic effects of the Project during both the construction and operating periods. Benefits during construction include employment, expenditures on goods and services, and Provincial taxation revenue. Benefits during operations include a potential revenue stream for the Province, power for general development and new industry in Labrador, a strengthened workforce and business community, and modest long-term employment in operations and maintenance. Challenges associated with realizing these benefits are discussed as well as the many concerns expressed by participants, including in-migration. The details of Nalcor's Benefits Strategy are explored and some recommendations made for improving certain of its provisions.

12.1 ECONOMY

12.1.1 Nalcor's Views

Construction Benefits

Nalcor's estimate of the total capital cost of the Project is \$6.4 billion in 2010 dollars, \$2.9 billion for Muskrat Falls and \$3.5 billion for Gull Island. The capital cost also breaks down as \$2.5 billion for labour, \$2.9 billion for materials and \$1.0 billion for equipment. Related tax revenue to the provincial government during the construction period is estimated at \$340 million.

As the following table shows, construction activities would enhance provincial income by approximately \$2.1 billion, of which \$700 million would accrue to labour and business in Labrador.

Income to Labour and Business (includes direct, indirect and induced)	Gull Island (\$M)	Muskrat Falls (\$M)	Total Project (\$M)
Newfoundland and Labrador total	\$1,259	\$808	\$2,067
Labrador	\$413	\$290	\$703

Nalcor stated that employment opportunities stemming from construction and operation of the Project would be its primary direct benefit and a substantial portion of secondary employment opportunities would occur naturally in Labrador. The Project would generate nearly 16,000 person years of direct employment in the province. Most of this (81 percent) would occur in Labrador and would be associated with reservoir preparation, construction of the dams, installation of generation equipment, and construction of the proposed transmission line. In addition, the Project would generate substantial indirect and induced employment. Indirect employment is employment resulting from the supply of goods and services to the Project and induced employment is employment resulting from expenditures of income in the economy by those directly and indirectly employed on the Project. A breakdown of the Newfoundland and Labrador employment for the preferred construction sequence follows:

Project Employment (PY)	Gull Island	Muskrat Falls	Total Project
Direct Project employment	9,991	5,638	15,629
Direct NL employment	6,514	3,676	10,190
Indirect NL employment	3,068	2,177	5,244
Induced NL employment	4,898	3,142	8,040
Total NL employment	14,480	8,995	23,474

Nalcor estimated that 65 percent of the total direct construction labour would come from Newfoundland and Labrador sources. Of this amount, 40 percent would come from the Island portion of the Province and 25 percent from Labrador (12.5 percent from the Upper Lake Melville area and 12.5 percent from the rest of Labrador). The remaining 35 percent would come from elsewhere in Canada and other countries. While every effort would be made to recruit local workers, labour shortages were anticipated in some trades. Nalcor anticipated that it would be able to employ everybody in Labrador who was appropriately trained, from an apprentice to a highly skilled tradesperson.

The Project would use a commute worker system. The majority of construction workers would be housed in accommodation complexes at the Project site. Project workers would spend a fixed period at the construction site followed by a fixed period away, usually in their home communities. Work schedules would vary widely due to the nature of the work, the level of responsibility of the worker, and the place of residence of the employee. Nalcor indicated that experience with the Hibernia project clearly indicated that the use of a good quality accommodation complex, in combination with 12-hour workdays, minimized interaction between workers and nearby communities and helped minimize in-migration. If flights were delayed or cancelled, workers would remain at the work site until the problem was resolved.

The actual number of workers and families who would choose to relocate to the area could not be predicted with certainty. Based on experience with large construction projects and lessons learned from other projects such as Voisey's Bay and Hibernia, Nalcor did not anticipate any major in-migration of workers to the Upper Lake Melville Area, though there would be some. Project-related in-migration to Labrador communities outside this region was not anticipated.

Mechanisms would be put in place to ensure that travel costs for workers in various regions of the province were not barriers to employment at the Project. While the actual mechanisms would be subject to labour and contractual negotiations, mechanisms could include the use of charters or commercial flights from designated pick up points paid directly by the Project, reimbursement of travel cost directly to contractors or individual workers, or a travel allowance or other mechanism included within the total compensation of workers. If a particular location within the province did not have sufficient numbers of workers to justify designating it as a pick up point, workers would be reimbursed for the use of commercial flights.

Nalcor stated that it did not anticipate any major impact on municipal or transportation infrastructure as a direct result of the Project. Over the longer term, local businesses could expand or new businesses could develop in Happy Valley-Goose Bay as a result of business opportunities created by the Project and this could create additional demands on the infrastructure within the town. However, such business expansion would increase the tax base and revenues, potentially offsetting any additional infrastructure costs incurred.

Nalcor did not expect the Project to result in a significant boom and bust. A bust was interpreted as a period in time where all activity stops, average income falls, and unemployment levels rise to an extreme such that workers are forced to leave the community. Given the duration of construction, the experience that workers would gain, and the business activity that would be created by the Project and other industrial opportunities that would come to Labrador as a result of available power, Labrador should not experience a sudden downturn in economic activity upon completion of the Project. Using accommodation complexes at the construction sites for both dams would reduce the potential for adverse effects associated with worker-community interaction, with boom and bust on housing and with in-migration into Happy Valley-Goose Bay.

In response to a suggestion by the Town of Happy Valley-Goose Bay, Nalcor stated that if workers were housed in the town, there would be a set of impacts not considered in the EIS but that this option could be evaluated at the detailed planning stage.

Under the preferred construction sequence, construction of both facilities would take 11 to 12 years to complete, assuming a three-year overlap in construction between Muskrat Falls and Gull Island. Should sanction of the Gull Island portion of the Project not occur prior to the completion of construction of the Muskrat Falls facility, this would result in two separate and shorter duration employment opportunities. The degree to which this would occur would depend on the length of the delay and the perceived certainty of the construction of Gull Island proceeding. The longer the gap, the less certain people would be that the Gull Island portion of the Project would proceed, resulting in less in-migration and smaller Project-related demand for physical and social infrastructure and services.

An Impacts and Benefits Agreement has been negotiated with Innu Nation but details were not released due to confidentiality clauses in the Agreement.

Nalcor has also agreed with the Government of Newfoundland and Labrador on a Benefits Strategy for construction of the Lower Churchill Project. The Strategy committed that all work that could be performed in Newfoundland and Labrador, would be performed in the province. Nalcor would monitor employment, business expenditures, and contracts awarded and make available the aggregate data to the provincial government on a quarterly basis. Business expenditures would be provided by amount, type, location and type of contractor. This would allow the determination of the proportion of Project expenditures made within the province and within Labrador, by expenditure type and by business type or location. Summary information on expenditures would be issued on a regular basis.

In response to statements made by the Mayor of Happy Valley-Goose Bay suggesting that the Town's support of the Project would be contingent on Nalcor establishing a Labrador Heritage Fund, and Nalcor making competitively priced power available for industrial development in Labrador, Nalcor indicated that it could not agree to these conditions. Nalcor stated that it is not within its mandate to address municipal infrastructure issues but it would cooperate with various provincial departments and agencies that have that mandate to address any such problems. Nalcor also indicated that power would be available when Industry needed it and that electricity rates are set by the Province's Public Utilities Board.

Long-term Benefits

It is Nalcor's view that the Project represents the future for the people of Newfoundland and Labrador, and that it would provide the Province with a stable source of renewable energy and revenue for generations to come. Further, the Project would provide real opportunities for new, sustainable, economic development in Labrador. Upon completion of construction, the Province, and particularly Labrador, would benefit from a better trained and experienced workforce, improved infrastructure and a more diverse and experienced business sector. The Project would be a catalyst for future development in Labrador as the Hibernia project was for the Province's oil and gas sector. At the hearing, Mr. Gilbert Bennett stated:

One of the most durable and lasting benefits would be the availability of a large block of renewable power located less than 100 kilometres away from where we sit right now. The benefit of having access to this reliable competitively priced electricity at such close proximity cannot be understated as a facilitator or enabler of future development opportunities.

Nalcor also noted that the Government of Newfoundland and Labrador has labeled the Project the "centerpiece" of its Energy Plan.

Upon completion of construction, there would be a total of 80 direct operational and maintenance jobs, 46 for Muskrat Falls and 34 for Gull Island. The total ongoing annual operating expenditures, including labour, would be approximately \$17 million for Muskrat Falls and \$14 million for Gull Island.

Nalcor stated that over the longer-term, the Province of Newfoundland and Labrador would receive in excess of \$1 billion annually in net financial benefits once the construction debt has been retired. Project cash flows would accrue to Nalcor and then be distributed as follows: first, a royalty would be paid to Innu Nation in amounts established by the *Tshash Petapen* Agreement, then the remaining amounts would either be retained by Nalcor for investment in other energy-related activities or returned as dividends to its shareholder, the Government of Newfoundland and Labrador.

In short, Nalcor's position is that the economic benefits from the Project would have a lasting impact on both the Upper Lake Melville area and the rest of the province.

Nalcor's proposed mitigation measures and monitoring related to the economy are included with the package of measures listed in section 12.2.1 on Employment and Business Opportunities.

12.1.2 Participants' Views

Construction Benefits

Some participants felt that the Project would provide much needed employment opportunities to the residents of Labrador and would help secure long-term opportunities for younger people in particular who are just beginning their working lives.

The Department of Innovation, Trade and Rural Development indicated that Project expenditures would result in employment, business opportunities and income that would affect the Island, Labrador and, especially, the communities of the Upper Lake Melville area.

Many participants were skeptical of Nalcor's ability to meet the local and provincial hiring targets. They felt that similar commitments made for the Voisey's Bay project were not achieved because of the lack of appropriately trained people in the region and province and because contractors and sub-contractors were not bound by the adjacency principle or the Benefits Strategy. Qualified local workers either did not have sufficient seniority under the collective agreements in place or were not members of the various trade unions at the job site. Grand RiverKeeper Labrador Inc. shared this view and stated that the bulk of the benefits from the Project would accrue to people outside of Labrador.

A number of participants expressed concern about the types of positions that local and provincial workers might get. They described the construction jobs as being short term and were concerned about the limited number of long-term jobs resulting from the Project. It was felt that the majority of Project construction positions would be low end or entry-level positions, and few management jobs would be held by local residents.

Other participants commented on the national shortage of skilled construction workers and indicated that it may be difficult to attract sufficient skilled workers from within the region or the Province more generally. The provincial Department of Human Resources, Labour and Employment indicated that while research was not complete on a labour force study that it was

working on, results strongly suggested that workers from outside the region, whether they were expatriates, temporary foreign workers and/or immigrants, would be necessary to complete the Project. The Department also indicated that it would work with Nalcor and the Department of Education through a formal working group to develop a strategic coordinated approach to meeting the Project's workforce requirements.

Several participants expressed concerns with in-migration and with boom and bust effects. Participants did not feel that isolated workers camps would prevent in-migration and they maintained that a boom and bust effect would be felt in the service preparedness of the Town of Happy Valley-Goose Bay and in the levels of out-migration from coastal communities. One participant stated that while Nalcor's assessment focused on the economic aspect of boom and bust, there would be social and cultural implications as well.

The Labrador Economic Development Board agreed with Nalcor that having camp accommodation would reduce the boom and bust effects of the Project with respect to housing shortages. However, workers should not be forced to live on-site if they are resident of the Town of Happy Valley-Goose Bay as this would negatively impact their quality of life.

Despite Nalcor's prediction that in-migration would not be significant, the provincial Department of Education stated that monitoring of this would need to be done by Nalcor in conjunction with the Department. If there were to be a large number of families moving to the region, advance planning would be needed to ensure adequate teachers, resources and education infrastructure were available.

The Nunatsiavut Government claimed that in-migration was certain to occur because the adjacency hiring principle would force existing jobs within Happy Valley-Goose Bay to be backfilled. The *AngajukKâk* (elected community leader) of Nain, indicated that Happy Valley-Goose Bay is a "magnet" for many Inuit of small Nunatsiavut communities, and residents of these communities often move to larger centres to seek better training and job opportunities and a different lifestyle.

Long-Term Benefits

A number of participants expressed the concern that Labradorians would not gain any long-term benefit from the Project and the long-term damage to the river would be far greater than the short-term employment created. Some felt that more long-term benefits could be gained by transforming the area into a site for eco-tourism. Others felt very strongly that no amount of money or employment benefits were sufficient to justify the damming and destruction of the Churchill River and loss of their current quality of life – many of these participants could not support the Project under any circumstances.

The Labrador North Chamber of Commerce indicated that its continued support for the Project would be dependent upon the medium and long-term benefits accruing to Labrador. The Chamber indicated that it anticipates there would be continued industrial development and employment growth in Central Labrador resulting from the Project. Key to this vision was timely access to additional power at preferred power rates for existing companies and industrial expansion. The Chamber's support was therefore conditional on not just the direct benefits resulting from the Project but also on utilization of Lower Churchill power at preferred rates for regional economic, industrial and community development.

The Mayor of Happy Valley-Goose Bay stated that the Town's support for the Project was contingent on Nalcor finding the optimal balance between maximum economic benefits and minimum environmental impact. The Town's support was conditional on power being made

available to meet the demands of industry currently and into the future; the creation of a Labrador Heritage Fund to help improve infrastructure in Labrador from the proceeds of the Project and other projects that may result from the availability of this power; and, competitive hydro rates for industrial, commercial and residential customers.

The Central Labrador Economic Development Board, in its closing comments at the hearing, concluded that the development of the Lower Churchill would provide direct and indirect jobs and wealth for citizens from across Labrador. Hotels, restaurants, grocery stores, car dealerships, auto repair shops, nightclubs, clothing stores, and even local farmers would have an opportunity to grow their businesses and to prosper because of this Project. Labrador would grow and Labrador would prosper with the development of the lower Churchill hydroelectric resources at Muskrat Falls and Gull Island.

A participant at the hearing in Sheshatshiu noted the benefits that the Voisey's Bay project brought to that community in terms of much needed new housing and additional revenue. That participant expressed strong support for the Lower Churchill Project as a way to secure the future for Sheshatshiu, and also support for the *Tshash Petapen* Agreement that he was recommending to the Innu people. The participant indicated that when the Agreement is ratified by the Innu people, it would allow the Project to proceed. The *Tshash Petapen* Agreement seeks to resolve key issues related to land claims (Innu Rights Agreement), Innu redress for the Upper Churchill hydroelectric development and the Lower Churchill Impacts and Benefits Agreement.

A number of participants at the same hearing indicated that they have had no input and have little knowledge about the *Tshash Petapen* Agreement and did not know how it would impact the community. Concern was expressed that the Project would benefit only the Innu leadership and their businesses. Other participants stated that existing projects such as Voisey's Bay provide sufficient revenue to address community issues and the Lower Churchill Project was not needed. It was also suggested that exposure to the wage economy would have negative effects on the Innu people.

The provincial Department of Finance indicated that the Government of Newfoundland and Labrador expects to earn a reasonable return from the equity invested to finance the Project. Any dividends received from the Project would be used by Government to fund priorities established by the government of the day.

Business development groups such as the St. John's Board of Trade and the Newfoundland and Labrador Oil and Gas Industries Association were supportive of the Project. The Newfoundland and Labrador Oil and Gas Industries Association stated that the Project would provide opportunities in Newfoundland and Labrador for future industrial activities that require large quantities of reliable and predictably priced electricity. The infrastructure and capacity building that result from the Lower Churchill Project would further strengthen Newfoundland and Labrador's ability to attract industry.

12.1.3 Panel Conclusions and Recommendations

In reaching its conclusions on the economic impacts of the Project during both the construction and operating periods, the Panel considered the following factors to be particularly relevant:

- Nalcor's prediction that the economic impacts of its proposed Project would be beneficial locally, regionally, provincially and nationally; during construction it would generate significant employment and business opportunities with resulting tax revenues to the

- Provincial Government; during operation it would provide some employment benefits, available, competitively priced power, and an ongoing and significant revenue stream;
- the widely different views heard from participants regarding projected benefits and whether or not they would be achievable;
 - Nalcor's Benefits Strategy as agreed to by the Government of Newfoundland and Labrador and put forward as a key mechanism to address concerns raised by participants and to maximize benefits during construction;
 - particular challenges associated with the Newfoundland and Labrador economy achieving the predicted annual net financial benefits which are based primarily on the Project's cash flow;
 - the different views on Project-related in-migration and possible adverse impacts on municipal infrastructure and services;
 - the role of Agreements with Aboriginal people in delivering economic benefits; and
 - economic implications of separate sanction decisions for Muskrat Falls and Gull Island.

Construction Benefits

The Panel acknowledges that the proposed Project is big by any standard of measurement. In summary, Nalcor's estimated capital cost is \$6.4 billion in 2010 dollars and its preferred construction sequence is dam and generating facilities at Muskrat Falls plus associated transmission (\$2.5 billion) followed by dam and generating facilities at Gull Island (\$3.9 billion). The construction period would be 11 to 12 years with each of Muskrat Falls and Gull Island taking approximately 7 years with a three year overlap. Projections for total direct employment are in the order of 15,600 person years (approximately 5,600 person years for Muskrat Falls and 10,000 person years for Gull Island). In addition to direct employment, Nalcor's economic modelling predicts approximately 5,200 person years of indirect employment and 8,000 person years of induced employment in Newfoundland and Labrador, of which approximately 40 percent is attributable to Muskrat Falls. Nalcor also estimates that between \$500 million and \$1 billion will be spent on goods and services from Newfoundland and Labrador.

In addition to the above summary, the Panel notes Nalcor's estimate, provided at the hearing, that construction activities would enhance provincial income by a total in excess of \$2 billion, of which \$700 million would accrue to labour and business in Labrador. The Panel also notes that employment increases in the forest harvesting and processing sectors would result from implementation of the Panel's recommendations on reservoir clearing in Chapter 4.

However, whether or not these projected benefits could be realized to their maximum at the local, regional and provincial levels is an important question. Many participants expressed skepticism regarding projected employment and business opportunities. They based their concern on experience with previous projects in the area and cited a number of issues, including contractors and subcontractors not being bound sufficiently by the adjacency principle, barriers to local workers due to union membership requirements, lack of timely training, and cultural issues.

The Panel notes that Nalcor's Benefits Strategy addresses a number of these concerns. This Strategy, agreed with the Government of Newfoundland and Labrador, commits that all work on the Project that can be performed in Newfoundland and Labrador, will be performed in the Province. Specific provisions are designed to enhance Project direct employment and the participation of local and provincial businesses in the provision of Project goods and services. The Employment and Business Opportunities Section below considers this Strategy and its provisions and makes specific recommendations.

With respect to taxes accruing to the provincial government as a result of Project construction activities (estimated by Nalcor to be \$340 million), the Panel notes that these would be reflected in the General Revenue Accounts of the Province with no pre-determined specific application. Potentially, benefits would be to the whole Province.

The Impacts and Benefits Agreement between Nalcor, the Government of Newfoundland and Labrador, and Innu Nation includes specific provisions regarding employment and goods and services. There are no similar agreements for other Aboriginal groups.

The Panel concludes that a construction project of this size in Central Labrador offers substantial potential economic benefits for all areas of the Province, especially Labrador and the Upper Lake Melville area. Those benefits result from direct high wage employment for people, the provision of goods and services by businesses, and the indirect and induced economic activity related to both.

Long-Term Benefits

The long-term economic benefits of the Project as put forward by Nalcor would be: employment throughout the operating period; a trained and experienced workforce and more capable business sector; availability of competitively priced power; and long-term annual net financial benefits to the Province based primarily on the Project's net cash flow from the sale of energy.

Direct employment during operations was estimated to be 80 jobs, 46 associated with Muskrat Falls and 34 with Gull Island. While the exact breakdown was not provided to the Panel, based on previous information in the EIS, approximately one-third of these jobs would be located at the control center in St. John's and the remaining two-thirds in Labrador, primarily for maintenance of facilities and transmission lines.

The Panel agrees that workers, trained and experienced on this Project, would be better positioned to gain employment on future projects and stronger companies could provide required goods and services locally and elsewhere. Following the construction period opportunities may or may not be available where employees and companies reside. Nevertheless, there would be a strengthened ability to deal with that situation and the benefits would be lasting and felt at the local, regional and provincial level.

The Panel concludes that the trained and experienced workforce and strengthened business capability developed during the construction period would provide important long-term benefits, as would the permanent employment, though modest, created during operations. These benefits would be lasting and felt at the local, regional and provincial level.

Similarly, the availability of power for new industry or general development is a staple of further economic development, and would benefit the whole province and Upper Lake Melville, particularly because of proximity.

However, the Panel has focused its attention on what Nalcor states as the principal long-term economic benefit, i.e. the net financial benefits to the economy of the Province that are generated primarily from the sale of power. Those benefits were estimated by Nalcor to be in excess of \$1 billion in 2010 dollars annually after debt repayment in 2050. Of this, \$300 million

was attributed to Muskrat Falls and \$700 million to Gull Island. Whether or not the Project could deliver this financial benefit would depend on a number of factors, including, markets for the power, transmission access, cost of delivery and market prices achieved. This matter was addressed in more detail in Chapter 4 and as concluded there, considerable uncertainty exists regarding the Project's ability to deliver financial benefits in the order of magnitude projected.

A second question has to do with the distribution of projected financial benefits. The Panel has been told that Project cash flows would accrue to Nalcor and would then be distributed. First, a royalty would be paid to Innu Nation in amounts as established by the *Tshash Petapen* Agreement. The remaining amounts would be either retained by Nalcor for investment in other energy-related activities or returned to its shareholder, the Government of Newfoundland and Labrador, as dividends. The Panel has no information with respect to the eventual distribution of shareholder dividends other than it would be a decision solely of the Government of Newfoundland and Labrador and that traditionally Government has not dedicated resource revenues to particular regions or services. Similarly, amounts retained by Nalcor would be used for investments and business that fall within Nalcor's mandate, without limitation as to the region of the province in which they might be used.

It is difficult for the Panel to assess the implications of those two factors. With respect to cash flows there is obviously a very wide range of possible outcomes. On the positive side, cash flows may be sufficiently high and distributed in a way that ensures the Project would provide equitable benefits throughout the Province. On the negative side, cash flows may be so low as to lengthen the time of debt repayment or even the ability of the Project to meet its operating and maintenance costs. In the extreme it may even require subsidy from other sources. Even in this event, it would be essential that sufficient resources be committed to the required environmental monitoring and management programs.

There is an additional point with respect to economic benefits and that is that all alternatives have some level of benefits associated with them. In Chapter 4 the Panel stated that the consideration of alternatives was inadequate and as such it makes it impossible to make a determination of how the Project compares to alternatives in terms of economic benefits.

Separate Sanction Decisions

The Panel notes that most of the benefits information discussed in this Chapter was based on the Project as a whole. Where possible, the statistical data was separated for Muskrat Falls and Gull Island. The fact that Gull Island is a completely separate sanction decision from Muskrat Falls leads to uncertainty regarding the time lag between the two. There has always been some uncertainty in this regard but it increased during hearing proceedings with the increased emphasis on Muskrat Falls. There is a possibility that Gull Island will be delayed. It could be for a year or indefinitely. It may not happen at all. Thus, while it is difficult to assess changes in effects, some observations can be made.

In the EIS, an overlap construction was preferred because it would reduce mobilization costs, allow better use of temporary infrastructure such as accommodation complexes, allow for better use and optimization of workforce and equipment, and shorten the construction. Presumably, if there is no overlap in construction, those advantages would be lost.

With no overlap in construction, activity peaks would be lower which might allow a higher percentage of employment opportunities to be filled from local and provincial labour forces. However, there would be less time to train new entrants, at least for the first construction period. There will be more ups and downs in the economy (mobilizing – downsizing – building up again). If the construction gap is of an indeterminate period, businesses may find that there are

not enough economies of scale to justify investment of the capital required to avail of the opportunities to provide goods and services to the Project. This may result in less demand for industrial and commercial land. With an indeterminate construction gap the tendency for in-migration would be less, thereby lessening any increased demand on infrastructure and services.

More importantly, with a construction gap of indeterminate duration, there would be considerable uncertainty that would affect the decisions that people have to make. Nalcor may mitigate or manage this uncertainty with a proper information or communications program, but it could only be removed completely by a common sanction decision.

Possible Adverse Effects

The likelihood and extent of in-migration related to employment on the Project or related to a general increase in economic activity in the area is discussed below. Any resulting impacts on community infrastructure or services are considered in Chapter 13.

In-migration

Happy Valley-Goose Bay is the largest community in the Upper Lake Melville region and the closest to the Project, approximately 30 kilometres from the proposed Muskrat Falls facility. The question has been raised regarding in-migration to Happy Valley-Goose Bay during Project construction. The Panel notes Nalcor's belief that the tendency of workers and families to move to this area and community in search of, or to facilitate employment, would be mitigated by Nalcor's use of workplace accommodations at Muskrat Falls and Gull Island, and by its travel policy for workers whereby workers will not be disadvantaged by travel cost. Nalcor's position is that some in-migration may occur, but it would be very little. It quoted experiences at other Projects (Voisey's Bay, Duck Pond, and Hibernia) in support of its position.

The Panel heard contrary evidence at the hearing. Many participants told the Panel that they disagreed with Nalcor's predictions and that they believed in-migration would occur and would have significant adverse impacts. In support, they stated that the role of Happy Valley-Goose Bay in the economy and way of life in Labrador is different from the examples given by Nalcor. The Panel was told during the Nain community hearing that some young people who got good paying jobs at Voisey's Bay or Happy Valley-Goose Bay, moved their families there because of the availability of better services and amenities, and this would be expected to continue with the Project. Others put forward the view that, as workers already employed in the town move to higher paying jobs with Nalcor, back-filling the jobs they leave would be done from the coast or even from foreign countries. Young people who are working away would come back for the opportunities. The Vice-Chair of Melville Native Housing Association, told the Panel that he left a well paying job in St. John's to come back to Labrador because he sees opportunity here and a friend of his from Nain summed it up by saying that from Nain, Goose Bay is Newfoundland's 'Fort Mac'.

The Panel concludes that because of Nalcor's mitigation measures it is unlikely there would be much in-migration of Project workers from outside Labrador. However, the Panel concludes that substantial in-migration from other Labrador communities (and possibly by foreign service workers) can reasonably be expected during Project construction, and perhaps in anticipation of it. It is impossible to determine levels at this time, but it could be substantial and is likely to contribute to adverse effects on community infrastructure and services.

Effects on Existing Local Businesses

Some participants expressed concern that the Project would result in some local businesses experiencing adverse impacts in the form of employee retention problems and threats to economic viability because of the necessity to pay higher wage rates. Neither Nalcor nor participants proposed any specific mitigation measures. It is the Panel's view that any such impact is not necessarily adverse for employees who would have available increased salaries and opportunities, or for companies which would be motivated to improve efficiency, serve a larger customer base, or otherwise improve their viability. There may be a period of adjustment to changing market forces and some marginal companies may fail or be replaced by others.

The Panel concludes that any adverse effects on local businesses in the form of employee retention problems and threats to economic viability because of the necessity to pay higher wage rates would occur primarily in Happy Valley-Goose Bay and would not be significant.

12.2 EMPLOYMENT AND BUSINESS OPPORTUNITIES

12.2.1 Nalcor's Views

Employment

On July 14, 2010, the Provincial Government released the Lower Churchill Construction Project Benefits Strategy. The Strategy outlines the kinds of activities and procedures which would be followed by Nalcor Energy and its contractors and sub-contractors regarding employment and business benefits during construction of the Project. Based on current estimates, the following minimum activity would occur within the Province:

	Engineering & Project Management (person years)	Construction & Assembly (person years)	Total (person years)
Muskat Falls	750	3,000	3,750
Gull Island	2,000	6,500	8,500

The hiring protocol in the Strategy requires that first consideration for employment would reflect commitments made in any executed Impacts Benefits Agreement, followed by qualified residents of Labrador, and then qualified residents of the Island. Any collective agreements entered into by Nalcor or its primary contractors would contain provisions consistent with this protocol and the hiring priority sequence. Prior to Project sanction, Nalcor would develop and implement a Gender Equity Program and a Diversity Program for all Project activities in the province, for both the construction and operating periods of the Project. Contractors, service providers, consultants, and suppliers within the province would be given full and fair opportunity to participate, on a competitive basis, to supply goods and services. Nalcor would ensure that its primary contractors and immediate subcontractors are aware of the terms of the Benefits Strategy and the compliance requirements.

The Women's Employment Plan would include qualitative and quantitative employment targets and other initiatives to achieve greater female participation in the workforce, and mechanisms to overcome barriers, such as jobsite harassment and lack of access to childcare. The Plan would also include monitoring and reporting provisions as required by the Benefits Strategy. The Plan would be developed with input from community and other stakeholder groups. Nalcor also

stated that it would consider using "name-hire" as an approach to increasing female participation in the work force, and the use of the Human Rights Chapter H-14 article 19.1, which would allow an employer to give an advantage to groups that are traditionally disadvantaged. Under the "name-hire" mechanism a specific number of hires would be done on a 50/50 basis, with the union selecting half and the company selecting the other half.

The preliminary objectives and strategies identified to ensure gender equity and diversity in the Project workforce are reflected in Nalcor's mitigation and monitoring measures listed later.

In responding to concerns expressed by the Mokami Status of Women Council that Nalcor had not conducted sufficient consultation on women's issues, Nalcor indicated that over the last three years it has undertaken considerable work in this area. This work included literature reviews, consultation and community engagement to fully understand the needs of women and communities and the barriers that women encounter on large construction projects. Much of the consultation effort to date focused on economic and employment issues. As the Project progresses consultation would be expanded to address all issues of concern to women. Reporting and monitoring are integral to continuous improvement of a Gender Equity Program and would be implemented.

Nalcor indicated that although work schedules would be based on labour negotiations, it would provide flexible work schedules where possible to accommodate traditional harvesting and other Aboriginal cultural, family and community needs. Application of cultural and community leaves would be reviewed on an individual basis. The Impacts and Benefits Agreement with Innu Nation would also include provisions related to leave for harvesting or cultural purposes. Nevertheless, workers would need to adapt their harvesting activities to accommodate the rotational nature of Project-related work schedules.

The EIS indicated that all aboriginal groups would be encouraged to participate actively in the Project. However, Nalcor maintained that due to the minor impact of the Project beyond the mouth of the Churchill River, no Impacts and Benefits Agreements have been proposed for Nunatukavut and Nunatsiavut. Since the Project would not extend into areas traditionally used by the Innu of Quebec, no Impacts and Benefits Agreements have been proposed for them. However, if a common understanding could be reached on Project effects requiring some form of mitigation, Nalcor would discuss how to mitigate those effects. An Impacts and Benefits Agreement is one possible way, but there may also be other alternatives. To date no such understanding has been reached by Nalcor with any Aboriginal group other than Innu Nation. The Impacts and Benefits Agreement under the *Tshash Petapen* Agreement would define how Labrador Innu would participate in and benefit from the Project.

The EIS acknowledged that shortages of skilled labour in the Province, and more generally in Canada, would be a major challenge in attracting skilled construction workers for the Project, particularly given the ongoing demand for such workers across the country. Specific initiatives would be required to address this situation.

Nalcor referenced its participation in the Labrador Aboriginal Training Partnership, which oversees a comprehensive training-to-employment plan that would prepare Innu, Inuit and NunatuKavut community individuals for employment opportunities created through resource development throughout Labrador. The Labrador Aboriginal Training Partnership was a joint \$30 million initiative funded by the Aboriginal Skills Employment Partnership of Human Resource and Skills Development Canada with in-kind contributions from the Nunatsiavut Government, Innu Nation, NunatuKavut, the Provincial Government and Nalcor. Funding for the Partnership expires on March 31, 2012. As of March 2011, approximately 335 people had received funding through approved Labrador Aboriginal Training Partnership training programs

and 125 had obtained employment. More than 50 Labrador participants had worked on Nalcor's 2010 summer field program.

To help increase employment and training opportunities, Nalcor indicated that it would try to increase the number of apprentices that could work with a fully qualified journeyman.

Business

Nalcor's breakdown of the Project's \$6.4 billion capital cost was \$2.5 billion for labour, \$2.9 billion for materials and \$1.0 billion for equipment. Between \$500 million and \$1 billion in goods and services would be supplied by Newfoundland and Labrador-based businesses. This estimate was based on an overview of the types of goods and services required, the capacity of the business community to supply these goods and services, and proposed proactive supplier development initiatives.

Nalcor committed to use a number of proven supplier development approaches to maximize local business benefits. Nalcor also committed to establish a Labrador Business Opportunities Committee as recommended by the Labrador North Chamber of Commerce and to hiring a full-time coordinator to be located in Labrador. It would also work with various business development groups such as the Labrador North Chamber of Commerce, the Central Labrador Economic Development Board and others. Labrador businesses would have an advantage due to their close proximity to the Project and this would help offset the possible disadvantage of smaller scale.

Nalcor indicated that the preferred Project construction sequence (Muskrat Falls, the smaller component constructed first) would have a positive effect on the patterns of use of infrastructure and services in the area, particularly Happy Valley-Goose Bay, as Project-related demands would grow more gradually. Nalcor stated that while the preferred construction sequence would extend the overall construction schedule, the associated effects on economy, employment and business would be expected to be the same in terms of their nature, magnitude, geographic extent, frequency, duration, and likelihood, as determined in the EIS.

Nalcor stated that business income and the knowledge and experience businesses would gain through working on the Project would enhance future business opportunities in the province. An enhanced capability and more expertise would enable them to better compete for similar work in the future. Nalcor further stated that the Project would greatly increase the power available for economic development in Labrador, and more generally the Province; more than doubling the amount of electricity currently available. This would provide long-term economic development opportunities that would benefit present and future generations.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to employment and business opportunities included the following:

- collect data on project employment by number employed, location of primary residence, occupational category, gender and Aboriginal status and report to government on a quarterly basis;
- collect data on Project expenditures to businesses by amount, location and type, with a report to government on a quarterly basis;
- implement the Lower Churchill Construction Project Benefits Strategy regarding employment and business benefits during construction of the Project, as required by the Provincial

Government, and ensure that the strategy would be followed by Nalcor, its contractors and sub-contractors, and would be reflected in all collective bargaining agreements;

- promote local employment through implementation of an adjacency policy for Project hiring, giving priority to qualified and experienced workers in the vicinity of the Project by first satisfying any Impacts and Benefits Agreement commitments with Aboriginal groups, then giving priority to residents of Labrador, followed by residents of Newfoundland, then residents of Canada, and finally workers from abroad;
- encourage preconstruction training initiatives to help local residents to fully participate in the Project and work with successful contractors to ensure adequate workplace training would be provided, and implement apprenticeship programs;
- offer technical advice to training institutions and government agencies to ensure training of relevant stakeholders;
- encourage the participation of Labrador Innu in the Project workforce by measures including: Impacts and Benefits Planning Strategy & Impacts and Benefits Agreement, support for an Innu Training Plan, an Innu Employment Training Coordinator, on-site Innu Liaison position, and employment and training information provided in Innu-aimun;
- provide flexible work schedules where possible to accommodate traditional harvesting and other Aboriginal cultural, family and community needs;
- use a commute worker system and house the workers in accommodation complexes at the Project site;
- compensate Labrador workers from different regions for the costs of travel to work on the Project;
- travel between the accommodation complexes and the airport will be scheduled so as to minimize impact on the community. If flights are delayed or cancelled, workers will remain at the work site until the problem is resolved;
- implement progressive hiring, promotion, and mentoring practices for women;
- implement measures to encourage the hiring of all types of workers for whom there currently exist barriers to employment, including women and Aboriginal people;
- develop, prior to beginning construction, a Gender Equity Program, Project Diversity Plan, Women's Employment Plan, and Business Access Strategy;
- include support for women in the Women's Employment Plan such as family-friendly policies and practices, facilities for women, safe accommodations, washrooms and change rooms, and health supports and supports for all employees including addiction services, addictions awareness training, harassment prevention training, zero tolerance on harassment, violence prevention training and gender and cultural sensitivity training;
- establish a Labrador Business Opportunities Committee with a full-time coordinator position in Labrador as part of the Benefits Strategy;
- maximize benefits to the local communities and the province through job creation, business activity, improved investor confidence, training initiatives for individuals and through supplier development programs for businesses;
- hold project-specific supplier development seminars in Labrador, prior to the start of construction on Project requirements, procurement procedures and Project opportunities;
- develop a Contracting and Purchasing Policy for the Project that would include sizing and designing of packages, where appropriate to fit the capabilities of Newfoundland and Labrador companies; and
- inform local businesses of Project employment needs as early as possible so they can retain their existing workers, identify gaps, and implement training programs.

12.2.2 Participants' Views

Employment

A number of participants stated that the Project's employment guarantees are weak and are similar to those for the Voisey's Bay mine site, which in the view of some have not resulted in long-term employment for the residents of Labrador. Participants were also concerned that systemic issues such as poor education, lack of training, cultural issues and unionization may prevent meaningful long-term employment at the Project for Labradorians, as happened at Voisey's Bay.

The International Brotherhood of Electrical Workers – Local 1615, which represents workers at the Holyrood thermal generating facility, acknowledged that there are outstanding issues with respect to the hiring practices for the Project arising from the Lower Churchill Construction Project Benefits Strategy and Nalcor's adjacency principle. Of particular concern to its membership is what would happen to them when the Holyrood facility is taken out of service and whether or not members would have any rights or priority to the operation and maintenance jobs that would be created once the Lower Churchill Project moves into the operational phase. The International Brotherhood of Electrical Workers indicated that these issues are under discussion with Nalcor and have yet to be resolved. It was acknowledged that union membership and seniority for Project construction jobs is another outstanding issue.

A participant at the community hearing in North West River stated that Labradorians should be given the majority of the jobs and that the adjacency principle should ensure that people truly from Labrador are successful in gaining Project employment. The participant was concerned with the definition of "residence" being used as a criterion for meeting the adjacency principle and felt that simply being a resident of Labrador for six months should not be sufficient for a person to qualify for the Labrador hiring priority.

Grand RiverKeeper Labrador Inc. and other participants recommended that an Impacts and Benefits Agreement be put in place between all residents of Labrador, the Provincial Government and Nalcor. While supporting the Innu Impacts and Benefits Agreement, that agreement did not provide benefits to Inuit, NunatuKavut and non-aboriginal residents.

The Nunatsiavut Government also expressed concern about Project employment benefits for residents of NunatuKavut and Nunatsiavut if they don't have an Impacts and Benefits Agreement, similar to that proposed for Innu Nation. The NunatuKavut Community Council had similar concerns, as did the Innu from Quebec with respect to their own situation. The Nunatsiavut Government recommended that Inuit employment levels at the Project should be equal to Innu employment levels.

Some members of the Innu community stated that the Impacts and Benefits Agreement would benefit only the Innu leaders and businesses and general members of the community would not benefit from it or from the construction of the Project. Benefits of short-term jobs would not counter the adverse impacts of the Project and their experiences with working on Voisey's Bay were not entirely positive. They stated that they did not receive the same opportunities as non-aboriginal people.

The Department of Education indicated that the Province was actively trying to encourage more young women to work in the trades area through programs such as the Skilled Trades Technology Program, which was offered in the K-12 school system.

The provincial Department of Natural Resources indicated that Nalcor would have to prepare a women's employment plan to be reviewed and approved by the Minister of Natural Resources and the Minister Responsible for the Status of Women. The Department indicated that gender equity and diversity programs, including women's employment plans and business access strategies were included in the benefits agreements for Hebron and Hibernia South, and that such plans are now required for all new large-scale resource developments, including the Lower Churchill Project.

The Newfoundland and Labrador Department of Human Resources, Labor and Employment indicated that Nalcor was committed to developing detailed plans and strategies to increase labour force participation among under represented groups such as women, persons with disabilities, aboriginal populations, youth and older workers. These types of strategies are referenced in the current Benefits Strategy and would be further developed in the gender equity and diversity plans.

The Department of Labrador and Aboriginal Affairs indicated that the Benefits Strategy contained provisions for adjacency priority for employment and provided for a diversity plan as well as a gender equity plan for employment with the Project. It also encouraged contracts and provisions to be ordered locally, thereby benefiting economic growth in the region. The Department noted that the Labrador Aboriginal Training Partnership was unique in its mandate since it has both a diversity plan and a gender equity plan.

The Mokami Status of Women Council stated that for women to benefit from the Project, gender equity must be enforced within the hiring policies of the Proponent and its subcontractors and that gender sensitivity training must be continuously given throughout the Project. Nalcor and its subcontractors must identify and ensure the appropriate supports are in place, including suitable childcare, appropriate accommodations, women supervisors and upper managers, gender sensitivity training and sexual harassment policies. The Council also felt that there had not been sufficient meaningful discussion and consultation on the impact of the Project on women in the Upper Lake Melville area and it expressed concerns about Nalcor's understanding of and commitment to gender equity and issues affecting women. It stated that there should be a hold or moratorium on further Project development until meaningful consultation and a gender-based analysis was undertaken.

A number of participants were skeptical that the gender equity and diversity plans would have any meaningful effect unless Nalcor ensures that contractors and subcontractors are required to follow all conditions and requirements of the plans.

The Women In Resource Development Corporation indicated its support for the Lower Churchill Construction Project Benefits Strategy negotiated between Nalcor and the Province, including the fact that a women's employment plan and a business access strategy would be developed as a result of the agreement. The Corporation presented a number of recommendations to help ensure maximum participation of women in the Project. Recommendations included opportunities for ongoing education and training in non-traditional occupations, mechanisms to allow women to advance through their apprenticeship to journey person status, progressive hiring and promotion and mentoring practices, gender awareness training for all employees and contract employees and the establishment of an overall environment that promotes gender equity in all aspects of the Project.

The Women In Resource Development Corporation also recommended that Nalcor work with labour groups for inclusion of special allowances for women, such as the "name hire" option, which has been used quite extensively and successfully in Alberta. This would allow the

company to hire more women than could have ordinarily been hired. All hires beyond the specified number of positions would be based on the collective agreement provisions. The Corporation further recommended that Nalcor consider using the Human Rights Special Program, Chapter H-14, Article 19.1, which allows employers to give an advantage to groups that have been traditionally disadvantaged.

The Nunatsiavut Government stated that in addition to offsetting the cost of travel to and from the Project and coastal Labrador, Nalcor should also develop a strategy to assist employees who are unable to leave Happy Valley-Goose Bay at the end of their work schedule, due to weather delays, which are common along the north coast communities.

Many participants at the hearing in Sheshatshiu indicated that the lack of basic education is a major problem in the community and this would make it difficult for residents to get employment at the Project. Those that are able to get employment would be entry-level laborers, housekeeping or kitchen staff. This view reflects experience with the Voisey's Bay project, where very few Innu have been able to secure long-term employment despite their proximity to the Project. Other participants spoke about the importance of the Project in helping the Innu move forward and felt that it represents an opportunity for young people to gain meaningful, long-term employment, and in so doing, perhaps regain control of their lives.

Some Innu from Quebec were concerned about the likelihood of their people gaining long-term meaningful employment at the Project, given their limited education, skills, previous work experience, distance from the Project, language issues and lack of an Impacts and Benefits Agreement with Nalcor.

Participants supported the Labrador Aboriginal Training Partnership, but some questioned if enough training was being done for non-aboriginal people. Other participants questioned if there would be job opportunities for the new graduates and asked if Nalcor was committed to taking on new graduates and helping them progress through the apprenticeship programs. Participants at various community hearings, including those in Sheshatshiu and Cartwright, indicated that in the past they had taken various training programs but had been unsuccessful in finding long-term meaningful jobs at the Voisey's Bay project.

A participant at the hearing in Sheshatshiu stated that in addition to training Innu in construction and other required Project skills, Nalcor and programs such as the Labrador Aboriginal Training Partnership should also provide training and assistance to Innu participants to help them adapt to a wage economy and to deal with the stresses associated with it. Such programs would help the Innu people address their own internal issues. If not, the Innu would continue to struggle with socio economic issues and they would continue to be "wounded".

The Nunatsiavut Government indicated that while the Labrador Aboriginal Training Partnership was a good program that was helping many Aboriginal people gain useful training for future job opportunities on the Project, it cautioned that the Program's funding would expire in 2012. It stated that the Program should continue, and that Nalcor should support it with direct cash contributions. The federal government provided the only direct cash (\$15 million) contribution to the program and if Nalcor were serious about building capacity and making this Project sustainable, it should contribute cash rather than just in-kind support. Other participants were supportive of this recommendation.

Another participant stated that Labradorians should be trained for the high-level, high-paying management and supervisory positions. That participant further stated that, while Nalcor was providing some assistance for training Aboriginal people in Labrador, it was a limited training

opportunity with a maximum of two-year funding and that Nalcor should be providing long-term training opportunities.

The Nunatsiavut Government and the *AngajukKâk* of Nain indicated that, all too often, people who live closest to the various training programs are those who benefit the most from the training. This is a major problem for people living on the north coast of Labrador and to address it, more Project-related training should be offered in smaller communities, such as Nain. This would allow higher participation in training, particularly for women and others who could not leave their communities for long periods as required for training programs based outside their home community. The *AngajukKâk* indicated that to his knowledge, there has not been any training done in Nunatsiavut communities under the Labrador Aboriginal Training Partnership, and residents who wished to participate in the training offered had to leave their communities. The lack of economic development in many smaller communities further aggravates the situation, since people who receive basic apprenticeship training can't return to their communities to complete the program because there are generally no journeypersons there to supervise apprentices as they progress through their programs. The *AngajukKâk* wondered if the Labrador Aboriginal Training Partnership would allow a fully qualified journeyperson to be brought to a smaller community to work with and train apprentices in areas such as heavy equipment maintenance.

The Central Labrador Economic Development Board felt that the local training and long-term construction jobs resulting from the Project would have significant short-term spin off benefits for local businesses and long-term benefit for future growth and development of businesses throughout Labrador. The Board also felt that the Project would be instrumental in many other initiatives that would move Labrador forward for decades. The provincial Departments of Innovation, Trade and Rural Development and Labrador and Aboriginal Affairs expressed similar views.

The Central Labrador Economic Development Board also stated that "people now training for this Project would be able to transfer the skills that they are receiving to future major developments in construction, mining, forestry, offshore oil and gas over the next 20 to 30 years."

The Newfoundland and Labrador Oil and Gas Industry noted that there was a national shortage of skilled labour. It stated that the Project, along with a number of other ongoing and proposed projects, such as the Vale Inco smelter and Hebron, would help entice more people currently working out of the province to return.

Business

The Labrador North Chamber of Commerce noted that capacity gaps exist within the local business sector and suggested that some companies would have to partner with other larger companies to be able to provide products and services to the Project. The Chamber would also like to proceed with the creation of the Labrador Business Opportunities Committee, as outlined in the EIS.

Other participants stated that Labrador companies have limited financial capacity and often have difficulty accessing venture capital and would therefore be outbid by bigger Newfoundland and Labrador firms. A participant at the hearing in North West River indicated that businesses in the community would want full and fair opportunity to bid on the provision of products and services for the Project. However, the participant was concerned that since the community of North West River does not have an Impacts and Benefits Agreement with Nalcor, such as Innu Nation has negotiated, there are no assurances of any business contracts.

The Nunatsiavut Government indicated that Inuit businesses would be interested in business opportunities stemming from the Project and would need equal access to these opportunities. Some smaller contractors were concerned that they might not be able to bid on the work. The Nunatsiavut Government recommended that the level of Inuit business opportunities should be equal to the Innu business opportunities.

A number of interveners, including the Labrador North Chamber of Commerce and the Town of Happy Valley-Goose Bay, spoke to the need for access to electricity to facilitate future economic development. These organizations wanted to know whether there were any specific plans to provide Lower Churchill electricity to Labrador communities and if not, why not. The Nunatsiavut Government also stated that there is a desperate need for clean and affordable power for Nunatsiavut communities to address economic disparity, enable sustainable economic development of the north coast and reduce environmental degradation in Labrador's Inuit communities. The NunatuKavut Community Council and many other participants from coastal Labrador expressed similar views.

12.2.3 Panel Conclusions and Recommendations

In reaching its conclusions on maximizing the benefits from employment and business opportunities, the Panel considered the following factors to be particularly relevant:

- the Benefits Strategy which contains an 'Adjacency Policy' and an array of additional initiatives and commitments designed to ensure maximum benefits to the province and locally, in the areas of employment and business opportunities; union contract requirement to respect the hiring protocols; a commitment to a Gender Equity Program and a Diversity Program to be finalized with the relevant groups and organizations prior to Project sanction; requirement that all contractors and suppliers are to be bound by the provisions of the Strategy;
- the Innu Nation Impacts and Benefits Agreement which includes provisions that give first preference to Innu for employment opportunities and targeted amounts of goods and services expected to be provided by businesses in which Innu are involved;
- recommendations from a number of participants to address the problem areas;
- Nalcor's specific monitoring and mitigation commitments regarding employment and business opportunities as listed in the text above; and
- additional enhancement measures that are possible.

The Panel concludes that Nalcor's overall approach, including the Benefits Strategy and the detailed list of monitoring and mitigation measures, would address many of the concerns raised by participants and contribute greatly to maximizing employment benefits from the Project, ensuring meaningful employment experiences, and maximizing benefits to local and provincial businesses from the supply of goods and services to the Project. A recommendation that all these measures be fully implemented is made in Chapter 15.

The Panel further concludes that there are a number of enhancement measures that should be taken by Nalcor and these are recommended below. At the same time, the Panel notes that some of the responsibility for gaining benefits rests directly with the prospective worker or business. Whether or not success is achieved is often directly related to the amount of individual initiative taken to avail of opportunities available.

With respect to skills training, Nalcor's approach is generally to work with the established authorities and training institutions, provide information on needs, and encourage certain training initiatives. It is the Panel's view that the recognized shortage of skilled workers for this

Project from Labrador and elsewhere in the province would require special emphasis on selection and pre-construction training for selected candidates as well as innovative measures during construction.

The Panel concludes that Nalcor's Benefits Strategy, its monitoring and mitigation commitments, and the following recommendations, if complemented with appropriate initiatives from prospective workers and businesses, would contribute greatly to maximizing the benefits from employment opportunities and opportunities related to the provision of goods and services for Labrador and the Province generally.

RECOMMENDATION 12.1 Early candidate selection and training

The Panel recommends that, if the Project is approved, Nalcor take a more proactive approach to providing early and specific training programs to certain Labrador candidates. This approach could include measures such as early candidate selection, conditional letters of intended employment, and, on-the-job training at other Nalcor operations or with other entities with which Nalcor has influence.

RECOMMENDATION 12.2 Workplace attachment for apprenticeship graduates

The Panel recommends that, if the Project is approved, Nalcor commit to providing workplace attachment for both first and second year graduates of apprenticeship programs to the maximum extent possible.

RECOMMENDATION 12.3 Training to 'journeyperson' level in community of residence

The Panel recommends that, if the Project is approved, relevant provincial departments commit to explore with Nalcor, other educational entities and agencies and relevant communities in Labrador, how to implement to the extent practical, training to 'journeyperson' level in the community of residence.

RECOMMENDATION 12.4 Address wage subsidy stigma

The Panel recommends that, if the Project is approved, to the extent that wage subsidies might be available and used for new job entrants, Nalcor implement an education and communications program to address and remove the stigma that some might feel is associated with such a practice.

RECOMMENDATION 12.5 Preparing for participation in wage economy

The Panel recommends that, if the Project is approved, Nalcor develop and implement, in consultation with Aboriginal groups, an appropriate orientation and information process to assist prospective employees who might have little or no experience of participation in a wage economy. Nalcor should also expand training programs to include, in addition to skills training, training to equip potential Aboriginal employees to deal with various financial, social and cultural challenges as a result of employment in the construction industry. In consultation with Aboriginal groups, Nalcor should also consider providing additional money management programs such as payroll saving schemes.

RECOMMENDATION 12.6 Continuation of Labrador Aboriginal Training Partnership

The Panel recommends that, if the Project is approved, Nalcor support the continuation of the Labrador Aboriginal Training Partnership beyond 2012, including making a financial

contribution if required to both enable current participants to complete their training and to meet additional training requirements.

At the hearing sessions in Sept-Iles, a number of Aboriginal groups expressed the view that, should the Project proceed, some of their members would be interested in employment opportunities. While it is not clear how many would avail themselves of those opportunities, the Panel would consider such involvement to be very beneficial.

RECOMMENDATION 12.7 Employment outreach to Quebec Aboriginal communities

The Panel recommends that, if the Project is approved, Nalcor initiate an employment outreach program for interested Aboriginal groups in Quebec; such a program could include among other measures, a specific recruitment program, transportation assistance from Sept-Iles, and measures to address social and cultural issues including any associated language barriers.

Business Opportunities

There are measures that can enhance the initiatives already committed by Nalcor for maximizing the benefits that can accrue from business opportunities related to the supply of goods and services to the Project. For example, the concept of using quantitative objectives or targets to help maximize benefits in a particular sector is already used by Nalcor in the Gender Equity Program, the Diversity Program, for employment levels both in engineering and in general construction, and for goods and services contracts for Innu Nation. This concept should be extended to the general goods and services sector.

RECOMMENDATION 12.8 Quantitative targets for goods and services

The Panel recommends that, if the Project is approved, the concept of quantitative objectives or targets be applied to the provision of goods and services, with targets established both for the province as a whole, and for Labrador.

RECOMMENDATION 12.9 Enhanced supplier development program

The Panel recommends that, if the Project is approved, Nalcor enhance its supplier development program by implementing the following measures: (a) establish the Labrador Business Opportunities Committee and appoint the full time Coordinator in Happy Valley-Goose Bay as soon as possible, (b) ensure the Coordinator (a Nalcor employee) has sufficient seniority within the organization to influence relevant procurement decisions and has full access to all procurement information and related decision making, (c) release as soon as possible the list of goods and services required by the Project, with specific indications of time frame, approximate volumes and dollar values or ranges as appropriate, and (d) ensure immediately that all engineering management personnel involved in specifications, bidder prequalification, and procurement are fully aware of Nalcor's commitments towards maximizing benefits in this area and act accordingly.

It is important for businesses and prospective bidders to have accurate and timely information to help them make their capacity investment decisions. Thus, at the time of Muskrat Falls sanction, it would be important to factor in the most up to date information about that part of the Project, as well as general prospective information on Gull Island. If, for any reason, Gull Island were to be sanctioned first, then the same principle would apply.

RECOMMENDATION 12.10 Update quantitative targets at time of sanction

The Panel recommends that, if the Project is approved, Nalcor update at the time of Muskrat Falls sanction, the quantitative objectives or targets and the detailed list of goods and services required by the Project. Further, that this update be done in consultation with interested parties and the information be provided for Muskrat Falls construction and, to the extent possible, for the Project as a whole.

RECOMMENDATION 12.11 Transparent bidding process

The Panel recommends that, if the Project is approved, Nalcor implement a transparent bidding process that ensures that bidders are fully aware of the decision-making process, unsuccessful bidders can find out the reasons why and thereby improve, and Nalcor's commitments and programs apply and are enforced by all its contractors, sub-contractors and suppliers.

Implementation of Business Strategy (General)

Under the Strategy, Nalcor is required to report monthly to Government on all employment and goods and services information in sufficient detail to monitor progress against the stated targets, and to report quarterly on compliance with the principles of the Strategy. The information reported is, or may be, subject to the confidentiality provisions of the Nalcor legislation. Also, under certain conditions, the Minister, at his/her sole discretion, can modify the benefits commitments.

RECOMMENDATION 12.12 Modifications to the Benefits Strategy

The Panel recommends that, if the Project is approved, Nalcor and the provincial Department of Natural Resources modify two overall provisions of the Benefits Strategy. The first is to ensure that both the monthly reports on employment and goods and services and the quarterly reports on compliance are publically available and not restricted by the confidentiality provisions of Nalcor's legislation. The second is to remove the provision that allows the Minister to modify the benefits targets and other commitments regarding this Project at the Minister's sole discretion.

13 FAMILY AND COMMUNITY LIFE, AND PUBLIC SERVICES

This chapter focuses on the key effects of the Project on communities and families. Issues and concerns raised by participants include existing community vulnerabilities, the adverse effects of high wage employment, the effects on health, social services and public infrastructure, the effects of methylmercury in fish and other country food, electrical power supply for coastal communities, disparity in financial benefits, redress for the effects of the Churchill Falls development and consultation with Aboriginal communities.

13.1 EFFECTS ON COMMUNITIES AND FAMILIES

13.1.1 Nalcor's Views

Nalcor defined the Assessment area for community health as the Upper Lake Melville area, stating that this is where primary interactions would occur. Nalcor estimated that the Project would have both positive and adverse effects on communities and that these effects would occur largely during construction, through employment and demands on businesses, services and infrastructure. Nalcor stated that the use of materials and services required during construction and the indirect effects from employee spending in the communities could create positive effects on the local economy and businesses. However, it also acknowledged the potential for rapid inflation followed by a rapid decline post-construction (boom and bust). Nalcor also stated that other potentially adverse effects might include relocation of individuals and families, and disruption of traditional activities.

Nalcor explained that the Project's effects on communities through worker-community interaction would be reduced through accommodation camps, a rotating work schedule of fixed periods, an extended workday and transportation to and from the airport and construction sites. In response to comments from Aboriginal groups relative to the development of alternative work schedules compatible with traditional activities, Nalcor stated that it would, to the extent feasible, allow flexible work schedules and community leave provisions for Aboriginal workers requiring time away from the Project to engage in traditional activities. Further discussion regarding flexible work schedules is included in Chapter 12.

Nalcor identified community health issues within the Upper Lake Melville area as including the potential for increased alcohol and drug use, the health of the individual and the family, and the loss of the traditional way of life. One of the most pressing existing health problems was cited as alcohol and drug abuse, which was believed to lead to higher rates of child abuse and neglect, family dysfunction and suicide. The Labrador Innu population was noted as being at risk for health problems, particularly obesity and type II diabetes, because of the decreased proportion of country food in their diet.

The main driver of change for communities during each phase of the Project would be employment and the interactions between the commuting workforce and local residents of the Upper Lake Melville area. Nalcor also estimated that any experienced health effects would likely be associated with increased personal income and the choices people would make regarding how to spend it. However, Nalcor pointed out that there were currently existing substance abuse problems in the area and did not anticipate the Project would cause additional community health issues.

Nalcor noted that suicide is a serious problem in Sheshatshiu, with rates four times higher than the rest of the region. Risk factors for suicide included mental health issues, alcohol-related factors, feelings of isolation and, for many Innu youth, a lack of protective factors such as a well-balanced family life.

Nalcor stated that, based on examples elsewhere in Canada, implementing an Impacts and Benefits Agreement would provide resources that could support Innu Nation in working with federal and provincial authorities to address any increases in community stress.

Nalcor has also proposed other measures that could help with the Project's effects on communities, including diversity and equity plans related to the provision of employment and business benefits to groups that are often economically and socially disadvantaged, for example women, Aboriginal people, visible minorities and persons with disabilities. Further discussion on how these measures would influence employment and business opportunities is found in Chapter 12.

With respect to the effect of noise on people in the communities, Nalcor pointed out that at the Gull Island Site, the closest area used by people was an abandoned cabin approximately 2.4 kilometres from the facility and there were no other areas used by people located within five kilometres of the site. At the Muskrat Falls Site, a number of cabins are located within ten kilometres. Nalcor stated that the Project was designed in a way that noise would be minimal, limited to the construction period and temporary. Noise during the operation phase would also be minimal.

As recommended by Health Canada, Nalcor stated that it would:

- develop a noise monitoring plan for the Hamilton River Road area in Happy Valley-Goose Bay in the event that increased traffic occurred due to Project activities;
- mitigate noise in the event that Project-related noise, combined with baseline noise, exceeds 75 decibels and if noise becomes an annoyance factor for a number of people; and
- develop a community consultation program to inform the public about expected Project-related noise levels at potentially sensitive cultural sites.

According to Nalcor, there was no reason to believe that noise would be an issue of concern for communities given the distance from the Project. Recommendation 9.1 addresses the monitoring and management of construction traffic and activities to minimize dust problems, noise and sleeping disturbance for occupants of cabins and camps.

In response to Innu Nation's suggestion of establishing a socio-economic monitoring and research institute to evaluate the effects of the Project, Nalcor noted the challenge of attribution, that is, distinguishing Project from non-Project related socio-economic effects, and stated that the institute was neither appropriate nor necessary in the context of this Project.

From a cumulative effects perspective, Nalcor predicted that the socio-economic effects of reasonably foreseeable projects would not overlap with the Project. However, Nalcor stated that each project or activity had the potential to increase the number of people migrating to Happy Valley-Goose Bay and the number of transient workers, thereby increasing the demand for social and other services. Positive effects were also predicted through increased jobs, income and self-esteem.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to community life included the following:

- minimize in-migration to Happy Valley-Goose Bay and associated effects on local communities through the use of contained accommodations complexes;
- transport workers by bus to and from the camps and the Happy Valley-Goose Bay airport for work rotation changeovers to limit their time spent in the community; and
- monitor noise as per Health Canada's recommendations.

13.1.2 Participants' Views

The Panel heard participants, particularly in Sheshatshiu, speak about existing problems related to alcohol and drug abuse. They spoke of Sheshatshiu as a vulnerable community, stating that the problems with alcohol and drugs were exacerbated by increases in the availability of money. They explained that, based on experience, some people use their wages to purchase alcohol and drugs, which in turn leads to increased substance abuse and marital and family problems. As a result, some participants did not think that alcohol should be provided on-site.

There were many concerns expressed regarding the vulnerability of children in Sheshatshiu. The Gathering Voices Project Team pointed to the high rates of youth suicide and stated that 44 percent of children in the community are under the protection of the provincial Department of Child, Youth and Family Services. Community members expressed concern that youth were losing their culture and language and suggested that youth with strong ties to traditions would be less likely to be involved with drugs and alcohol. A participant stated that the youth in the community were not experienced in handling money and tended to use it to purchase alcohol and drugs. Many Innu Elders were concerned about the future of the children and their community and stated that the Project would have a negative effect.

Sheshatshiu participants also noted that the training and capacity building role of the Health Canada-funded Labrador Innu Comprehensive Healing Strategy had been helpful in improving the community's ability to address social issues but more work needed to be done.

Memorial University Faculty members stated that the employment and increased income benefits of the Project could bring adverse impacts to vulnerable communities by adding to existing social stress, alcohol and substance abuse, personal debt, family violence, loss of autonomy and suicide. They stated that as these are existing issues in the community of Sheshatshiu, these adverse effects should have been included in the assessment.

The Nunatsiavut Government also stated that Nalcor's assessment of community health did not include existing substance abuse issues in the Upper Lake Melville Area as a measurable parameter. Key indicators should be established for Inuit mental and physical health, social well-being and employment, such as the incidence of diabetes, clients requiring home care services, the availability of housing, and mental health and addiction services.

Several participants noted that women in the Upper Lake Melville area would be affected differently than men. The provincial Women's Policy Office stated that women were interested in accessing non-traditional occupations that the Project may provide. The positive impacts for women availing themselves of employment with the Project would include higher incomes, full-time work and increased education and training. The Women's Policy Office stated that the Project would provide opportunities for new businesses and improved health outcomes. However, it was noted that violence prevention would be critical because higher incomes also

could bring increased violence and alcohol and drug abuse. As a result, the Women's Policy Office stated that mitigation should focus on social needs in the community, such as health, wellness, violence prevention training, and sexual assault assistance and that in addition, two-week rotation schedules would be the most family-friendly.

The Mokami Status of Women Council also stated that while an increase in income would offer a benefit, it was concerned that most women in the region lack the education and training to avail themselves of employment with the Project, and reap the employment benefits. Council representatives requested that gender equity be a consideration in Project employment practices. Other concerns noted by the Council were alcohol and drug abuse in the community and the link between substance abuse and violence. The Council explained that sexual and physical violence in the community disproportionately affected Aboriginal and disadvantaged women. It noted that it did not feel that Nalcor had acknowledged the level of existing social issues in the community and recommended a gender-based analysis to identify and mitigate problems. In addition, it was recommended that Nalcor develop a socio-economic monitoring process and continue liaising with the Council.

Other participants raised concerns surrounding the influx of construction workers and the potential impact this might have on sexual assaults and violence against women and children. They expressed concerns that sexually transmitted diseases and unplanned pregnancies would also increase.

The Nunatsiavut Government expressed concerns over the shortage of childcare facilities, which could prevent women from being able to take advantage of employment opportunities with the Project.

The Nunatsiavut Government also pointed out the adverse social impacts of rotational work schedules for members of coastal communities. It stated that anything more than a two-week rotational schedule would be a challenge for Inuit workers because it would be more likely for coastal community members to spend wages in Happy Valley-Goose Bay as opposed to bringing money back to their community. It also expressed concerns associated with the effects of out-migration on coastal communities and community mental health. It explained that many of the young people in the community had moved to larger centres for work, thus changing community and family dynamics.

An Innu participant stated that the Impacts and Benefits Agreement with Innu Nation would provide a substantial monetary base which members could use for hunting, fishing, and economic development. He pointed out that the agreement negotiated for the Voisey's Bay project allowed the community of Sheshatshiu to build more houses and infrastructure and to create a pension fund for Elders. Innu Nation would be able to continue to provide those types of services through the Impacts and Benefits Agreement for the Lower Churchill Project.

Members of other Aboriginal groups and communities expressed interest in negotiating benefits and impacts agreements or in the creation of a Labrador Heritage Fund, stating that they wanted to ensure that all communities affected by the Project would receive comparable benefits. Innu communities in Quebec spoke to the Panel regarding the benefits to their communities from financial compensation for the Romaine hydroelectric project.

While many participants recognized that the Project would encourage further development and provide an economic stimulus to the region, some participants were also concerned about the cumulative impact of future projects or activities on the health and life of community residents. Memorial University Faculty members pointed out the potential for cumulative effects resulting from the Labrador-Island Transmission Link project and the need for these to be assessed. The

Mokami Status of Women Council stated that long-term social and economic sustainability was important.

Monitoring and Mitigation

During the public hearing, while Nalcor noted that the Impacts and Benefits Agreement with Innu Nation would address some of the socio-economic concerns raised by Innu participants, an Innu Nation representative stated that the Agreement does not deal with those concerns and that monitoring and mitigation for socio-economic concerns should be addressed in the environmental assessment process.

Both the Nunatsiavut Government and Innu Nation expressed concerns regarding the lack of socio-economic baseline data for Aboriginal groups and stated that without this, it would be difficult to identify effects on communities. Innu Nation, in particular, stated that mitigation was not likely to be effective without the implementation of a monitoring program that would reflect the cultural and social diversity of Labrador. It proposed that a Socio-Economic Monitoring and Research Institute be established to address this need. The Nunatsiavut Government expressed concerns that socio-economic monitoring would not be made a priority for the Project and cited its experience with the Voisey's Bay project, where monitoring of social and health issues lapsed. The Nunatsiavut Government recommended an advisory committee provide advice to social service agencies.

The Nunatsiavut Government also noted that no Inuit-specific data was included in the assessment and, therefore, Nalcor's determination of the effect of the Project on community health did not adequately reflect existing vulnerabilities. With respect to monitoring, it noted that there were a number of interactions that were difficult to account for, particularly without sufficient baseline information.

Various measurable parameters were suggested for consideration by both Innu Nation and the Nunatsiavut Government, including housing and accommodation, health determinants, social support networks and lifestyle. Innu Nation noted that there were many limitations to existing socio-economic data collection, including language and education barriers and the inability to disaggregate results by community or Aboriginal group.

13.1.3 Panel Conclusions and Recommendations

In reaching its conclusions on community and family life, the Panel considered the following factors to be particularly relevant:

- role of Nalcor's accommodation camp and transportation policy in limiting worker interactions with local communities;
- existing levels of social problems, such as alcohol and drug abuse and violence in Happy Valley-Goose Bay and Sheshatshiu, affecting youth in Sheshatshiu in particular;
- links between high wage employment and levels of alcohol and drug abuse, sexual assault, family violence and suicide;
- uncertainty regarding the role of the *Tshash Petapen* Agreement in mitigating adverse social effects in Sheshatshiu;
- absence of a firm commitment from Nalcor or the Province to provide resources to address Project effects on individuals, families and communities, particularly with respect to potential increases in alcohol and substance abuse, sexual abuse and violence associated with high wages;

- challenges associated with monitoring and attributing socio-economic Project effects on community and family life; and
- potential for both individual benefits and community-level losses from Project-related out-migration from Labrador coastal communities.

The Panel acknowledges the role of the accommodation camp and transportation policy in effectively limiting Project worker interactions with nearby communities but notes that this does not address the effects of large scale, high wage employment on communities. As noted by many participants, large industrial projects and the money they bring to communities can have adverse effects, including increases in alcohol and substance abuse, sexual assault, family violence and youth suicide, particularly when there are existing vulnerabilities. Based on the evidence presented, the Panel expects that the effects of the Project on community and family life would be experienced primarily in Sheshatshiu and Happy Valley-Goose Bay.

Sheshatshiu

Both Nalcor and Sheshatshiu residents acknowledged the existing high prevalence of alcohol and drug abuse and suicide in the community. During the community hearing, several residents expressed the view that money brings more alcohol, drugs and violence. Innu children are particularly vulnerable because of their own and their parents' addictions to drugs and alcohol and many are in the care of the provincial Department of Child, Youth and Family Services. High youth suicide rates are of particular concern.

Community submissions indicated that these factors, combined with limitations in education, work experience, personal coping and money management skills, could constrain the ability of many Sheshatshiu residents to derive maximum benefit from Project employment and associated benefits. They also indicated a heightened risk that additional income or funding from the Impacts and Benefits Agreement would exacerbate existing problems.

Elders lamented the decline in the traditional way of life, both for its cultural importance and for the healthier lifestyle associated with time spent in the country. There was a general recognition that the traditional way of life is declining rapidly in the community as regular school attendance becomes a higher priority and younger people in particular, are drawn to non-traditional activities, such as attending dances, playing bingo, going to restaurants and unfortunately, also buying alcohol and drugs.

Community members expressed mixed views on the impacts of development projects and cited recent experiences from the Voisey's Bay project. The Impacts and Benefits Agreement from this project provided financial resources that improved the availability of community housing and provided a pension fund for seniors. However, many community members described the negative impacts of the Voisey's Bay project in relation to cash infusions as well, primarily related to increased consumption of alcohol and drugs and the violence and abuse that accompanied it.

During the environmental assessment, community members expressed mixed views on the *Tshash Petapen* Agreement, as noted in Chapter 12. The Panel notes that the Project would not proceed without ratification of the Agreement and Innu leaders have expressed their support for the agreement and the Project. The Panel recognizes that the financial security offered by the Agreement and the resolution of the long-standing land claim and Churchill Falls development issues would place the community in a better position to address existing social problems, and thereby extract maximum benefit from Project employment and business opportunities. The

Panel is aware that the ratification vote for the *Tshash Petapen* Agreement took place after the Panel's record closed at the end of the public hearing on April 15, 2011.

Against this background, it is difficult to forecast the extent to which community and family life in Sheshatshiu would benefit or be adversely affected by the Project. The Panel recognizes that the type of effect experienced would be largely dependent on the level of personal and family vulnerability. Given the extent of existing social issues, the Panel concludes that Project-related cash infusions would lead to an exacerbation of problems, such as substance abuse, youth suicide and family violence in Sheshatshiu.

The Panel heard conflicting views regarding the extent to which the *Tshash Petapen* Agreement would include provisions for the mitigation and monitoring of health and social effects of the Project. In the absence of detailed information about the contents of the Agreement and the eventual use of the funds by Innu leadership, the Panel cannot assume that these adverse effects would be fully mitigated.

The Panel also acknowledges the concerns expressed by Innu Nation regarding the challenges of monitoring social effects, including the absence of baseline data. The Panel addresses this issue in Recommendation 13.2.

If the *Tshash Petapen* Agreement does not address potential adverse health and social effects in Sheshatshiu resulting from the Project, the Panel notes that mitigation measures for these effects would fall within the mandate of the provincial Department of Health and Community Services. The Panel also notes that, at the federal level, Aboriginal Affairs and Northern Development Canada and Health Canada have played a role in addressing social challenges in the community of Sheshatshiu through the Labrador Innu Comprehensive Healing Strategy and that there is a potential need for ongoing federal involvement. Lessons learned from this federal initiative and from other Aboriginal communities that have been exposed to large scale industrial development could be applied to this Project.

The Panel recognizes that Innu Nation and government agencies must determine their respective roles in addressing underlying social issues and mitigating adverse social effects from the Project.

RECOMMENDATION 13.1 Sheshatshiu social effects mitigation

The Panel recommends that, if the Project is approved, Innu Nation, Sheshatshiu Innu Band Council, Nalcor, the provincial Department of Health and Community Services, and relevant federal government departments develop a Memorandum of Understanding with regard to identifying and implementing (a) mechanisms to prevent the exacerbation of existing social problems and (b) mitigation measures such as mental health and addictions services and family support required to address any Project-related increases in social problems. Each party would bring to the table its relevant knowledge and resources. In the case of Innu Nation and Sheshatshiu Innu Band Council, this would include any provisions of the Impacts and Benefits Agreement component of the *Tshash Petapen* Agreement that directly address this issue. In the case of Nalcor, its role would be to adjust hiring, employment and employee assistance arrangements where possible and appropriate to assist or reinforce mitigation. The federal and provincial governments should provide resources to discharge their responsibilities in these areas.

Happy Valley-Goose Bay

The Mokami Status of Women Council expressed serious concerns regarding the vulnerability of women and children, particularly Aboriginal and disadvantaged women, to sexual assault and violence tied to drug and alcohol use. It noted that high-wage employment can exacerbate these issues and Happy Valley-Goose Bay did not have drug and alcohol detoxification and rehabilitation facilities to address them. There is currently a wait list for mental health and addictions treatment at the regional health care centre, which serves coastal communities as well as Upper Lake Melville residents. The inability of the regional health centre to address existing needs and the need for additional resources to address expected increased demands because of Project-related effects was acknowledged by the Labrador-Grenfell Regional Health Authority. However, there has been no firm commitment of additional resources, beyond a needs assessment, from the provincial Department of Health and Community Services. This is discussed further and addressed in Section 13.2.3.

The adverse impacts of high wage employment in Happy Valley-Goose Bay would be related to the extent and nature of in-migration and the existing levels of alcohol and drug abuse. As noted in Chapter 12, the Panel expects that in-migration levels would exceed Nalcor's predictions. It is anticipated that most of the in-migration would be indirect, related to the expansion of local businesses and backfilling of local jobs as existing employees move to higher paid Project employment. The Panel recognizes that in-migration of workers who bring their families would not necessarily lead to adverse social effects. However, if there is any degree of in-migration of Project workers for high wage Project construction jobs, there is a greater likelihood of adverse effects, particularly on women and children.

The Panel was not provided with baseline data regarding existing levels of alcohol and drug abuse and related sexual assault and family violence in Happy Valley-Goose Bay. Evidence from participants, such as Innu Nation and the Nunatsiavut Government, indicated that this information is not easily available and that there are varying priorities in terms of the selection of socio-economic parameters to measure. In the absence of baseline data, it is difficult to assess the extent and precise nature of the current problem and the potential scale of its exacerbation as a result of high wage employment. While it is not possible to determine the extent to which the negative social impacts would be felt for those who are affected, the Panel recognizes that the impact would be serious and that disadvantaged women and children would be particularly vulnerable.

The Panel concludes that it is likely that there would be adverse effects in Happy Valley-Goose Bay resulting from high-wage employment, including increased substance abuse, sexual assault and violence against women and children.

Mitigation and Monitoring

The Panel notes the importance of and the challenges associated with mitigating and monitoring the adverse community health and social effects of a large-scale construction project.

Monitoring challenges include:

- selection of parameters given that different groups have different priorities, for example, alcohol and drug abuse, sexual assault, childcare, suicide;
- absence of consistent baseline health and social data broken down by Aboriginal group or community; and
- attribution (What is a Project effect? What is not?).

The negative social impacts of high wage employment are also difficult to mitigate given that assault and violence are often not reported. The wait-list for mental health and addictions services at the Labrador Health Centre indicates that, even for those who do seek services, the existing level is inadequate. Addressing the challenges of mitigating adverse social impacts requires additional information regarding baseline levels, the factors contributing to vulnerability and innovative approaches to community and family-level mitigation, in addition to a probable increase in the level of existing services.

Given the likelihood that there would be varying degrees of adverse social effects on Sheshatshiu and Happy Valley-Goose Bay, and potentially in North West River or Mud Lake, as a result of the Project, and perhaps more importantly, given the possibility that the Project could lead to additional development in the area with socio-economic repercussions, the Panel believes it is important to establish socio-economic baseline values for parameters that the communities and Aboriginal groups have identified as important. This initial step is a necessary pre-requisite to determining the extent and nature of Project effects and would have broad application to the assessment of any future economic development. Research is also required to determine the specific factors that make individuals susceptible to adverse social effects and the types of mitigation services and monitoring that would be needed to address them. A needs assessment would determine the gap between existing services and those that are required.

The Panel recognizes that this work would take several years to complete and would require social science expertise, a participatory approach to research and the cooperation and collaboration of government and community agencies and Aboriginal groups. The provincial Department of Health and Community Services has acknowledged its mandate and committed to conducting a needs assessment. It is the view of the Panel that the needs assessment should include a participatory research component to address the issues outlined above and to ensure that it results in a clear understanding of the baseline values for social parameters of importance to the local communities and recommendations for appropriate mitigation and ongoing monitoring.

To the extent that Project-related social effects are identified, the Panel expects that Nalcor and the Department of Health and Community Services would determine the source of funding required to address them.

RECOMMENDATION 13.2 Social effects needs assessment and research

The Panel recommends that, if the Project is approved, the provincial Department of Health and Community Services, in consultation with Aboriginal groups, and appropriate government and community agencies from the Upper Lake Melville area, conduct a social effects needs assessment, including an appropriately resourced participatory research component, that would determine the parameters to monitor, collect baseline data, and provide recommendations for social effects mitigation measures and an approach to ongoing monitoring. It is expected that Innu Nation would be a participant in the research and that the results would inform and enhance the social effects mitigation measures suggested in Recommendation 13.1. The results of the needs assessment would be documented in a public report and, subject to the agreement of participants, the results of the research would be published in a peer-reviewed journal.

The Panel concludes that, based on (a) the social vulnerabilities identified in both Sheshatshiu and Happy Valley-Goose Bay, and particularly those relating to children and youth in the former community, and (b) previous experience with the effects of additional money coming by way of both industrial wage employment and impacts and benefits agreements, that there would be a risk of a significant adverse effect on some families and individuals, and especially on children, if not adequately mitigated. The Panel is reasonably confident however that if the mitigation proposed in Recommendations 13.1, 13.2 and 13.5 is effectively and conscientiously applied by all parties, and if training and employment benefits are effectively distributed in the Upper Lake Melville region to include members of more disadvantaged groups, the risk would be reduced to an acceptable level.

The Panel expects that the adverse impacts of high-wage employment would be felt primarily in the construction period, which could last from seven to ten or more years, depending on the timing of the Muskrat Falls and Gull Island developments.

Alcohol at the Worksite Accommodations

The Panel notes that for employees struggling with addictions, the control of alcohol and drug use at the accommodation camps would be important in helping them to manage their addictions and retain their jobs. Nalcor intends to provide controlled access to alcohol at the worksite accommodations and this may help to reduce the risk that workers would travel to bars in Happy Valley-Goose Bay. A number of participants recommended that the worksite accommodations should be alcohol free and the Panel acknowledges that there is some uncertainty regarding whether controlled, limited access or no access to alcohol would be the most effective approach in preventing alcohol and drug abuse at the worksite. The Panel supports the recommendation of the provincial Department of Health and Community Services to provide professional addictions counselling services at the worksite.

RECOMMENDATION 13.3 Worksite measures to address addictions issues

The Panel recommends that, if the Project is approved, Nalcor conduct careful monitoring of the effectiveness of the policy of controlled access to alcohol at the accommodation camps and provide professional addictions counselling to employees.

Participation of Women and Aboriginals

Participants noted a number of possible constraints limiting the ability of women with children to avail themselves of job opportunities. These include access to child care in both Happy Valley-Goose Bay and Sheshatshiu, and work schedules. The provincial Women's Policy Office stated that a two-week on, two-week off work schedule would be the most family-friendly.

The Nunatsiavut Government identified a work schedule of two-weeks on, two-weeks off as being less likely to cause out-migration, although it also acknowledged the challenge of potential weather delays with frequent travel in and out of the communities. Innu Nation also expressed a preference for this type of work schedule.

RECOMMENDATION 13.4 Variety of work schedules

The Panel recommends that, if the Project is approved, Nalcor offer a variety of work schedules, and require the same of its contractors, to accommodate different groups of workers and to assist in meeting its employment goals, particularly for Aboriginal employees and women.

Coastal Community Out-Migration

Should the Project proceed, the Nunatsiavut Government noted the potential for increased out-migration from coastal communities, particularly of skilled workers who would be hard to replace. The Panel acknowledges that there is a trade-off between the benefits for individuals and families who are able to avail themselves of improved job opportunities and the adverse effects on coastal communities that lose skilled and educated residents as a result. The Panel also notes that Nalcor's travel policy for coastal community residents would ensure there is no financial penalty for those who choose to commute as opposed to move.

Benefits

The Panel observes that it is very likely that the Project contributed to the impetus to resolve the long-standing Innu Nation land claim and Churchill Falls redress issues and that this could be seen as a benefit of the Project to the Innu and to the region as a whole.

Project employment and the *Tshash Petapen* Agreement have the potential to bring substantial benefits to individuals, families and the community of Sheshatshiu. The financial resources included in the Agreement could be used to address existing community health and social issues. At the individual level, employment earnings would contribute to an improved standard of living. Depending on the priorities established by the community, royalties could be used to improve community infrastructure and services including housing, education and senior support.

As noted earlier, the extent to which individuals and the community of Sheshatshiu as a whole could benefit from the additional financial resources resulting from Project employment and the *Tshash Petapen* Agreement depends to a great extent on the choices made at the individual and community level regarding how the money is spent.

The Panel concludes that Project employment and the *Tshash Petapen* Agreement could provide benefits to residents of Sheshatshiu and that these benefits could be enhanced if a priority is placed on using these and government resources to address underlying social problems in the community. The financial benefits of the *Tshash Petapen* Agreement, in particular the royalties from the Project, would continue for as long as the Project operates and is profitable.

The Panel also recognizes that the social effects research work that has been recommended would contribute to an improved understanding of the social impacts of economic development that could be applied to ongoing economic development in the region.

13.2 COMMUNITY SERVICES

13.2.1 Nalcor's Views

In its socio-economic assessment, Nalcor predicted no significant adverse effects and some positive effects on community services after mitigation. Nalcor predicted that most effects would occur during construction and would be related to the increased demands on services arising from Project-related in-migration. Nalcor anticipated that most of these interactions would be in the Upper Lake Melville area and fewer interactions would occur beyond.

Nalcor recognized that health and social services in the Upper Lake Melville area are near or at capacity. The EIS described the current state of child welfare as "a system in crisis, lacking the capacity, particularly in Innu communities, to care for children with disabilities such as mental illness and autism". Nalcor recognized that a number of community health determinants such as

personal health practices and coping skills, health services and social support networks were already stressed. However, Nalcor stated that there would not be increased demand on social infrastructure and services, education, or housing as a result of the Project, due to limited interaction between the workforce and the community of Happy Valley-Goose Bay.

Nalcor claimed that accommodation provided for the Project would reduce demands on local services as many services would be provided on-site. The work camps would include recreational facilities, paramedic and emergency response as well as fire response. Nalcor would commit to workplace employee assistance, gender awareness and gender equity programs and control access to alcohol at the camps. It also noted that it contributed \$180,000 to Libra House, a women's shelter in Happy Valley-Goose Bay.

Nalcor stated that it would provide health and social services on-site for workers through the employee assistance program. During the public hearing, Nalcor stated that it would consider the recommendation of the provincial Department of Health and Community Services to supplement its primary care services to include health professionals to address employee addictions issues, but expected that its employee assistance program would provide all necessary counseling for employees.

Nalcor noted that certain government departments have specific mandates in areas of health and wellness and access to government resources to deal with the health and social issues that are currently present in the communities. Nalcor did not make commitments in these areas, stating that it would not duplicate efforts of those departments. Nalcor also pointed out that priorities for programs were determined at the level of the provincial government and provincial departments responsible for health in the region would need to monitor demand for services and determine if additional resources or programs would be required.

Nalcor stated that it would adopt mitigation approaches where required and would cooperate with agencies that have a direct role in providing these services. Further, Project revenues may ultimately be used to increase the level of services, although the Province would determine priorities.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to community services included the following:

- provide paramedic emergency responses and basic counselling services to minimize demand on regional health care;
- work with relevant stakeholders to enhance supports for women regarding issues on child care, health and wellness, housing needs and violence against women;
- cooperate with local government agencies throughout the planning process to minimize adverse effects on health services; and
- monitor in-migration of workers and their families and advise of any significant increases or changes in forecast to ensure that the school system can address any capacity issues.

13.2.2 Participants' Views

The Mayor of Happy Valley-Goose Bay expressed concerns about downloading the responsibility to manage increased stress on social service systems and noted that the Town would be unable to carry these additional responsibilities. The provincial Department of Health and Community Services affirmed that the delivery of health services is within its mandate and

stated that it would work with Nalcor to provide any additional services required. It stated that it would complete a needs assessment in conjunction with Nalcor to determine what increases in demand would occur as a result of the Project.

Participants stated that health services provided by the Labrador-Grenfell Regional Health Authority were currently at capacity and an influx of people would add to already long wait periods. The Nunatsiavut Government cited a current wait time for mental health and addiction services of six to eight weeks. These local services were described as being critical for community members within the Upper Lake Melville area and for residents of the coastal communities of Labrador. The provincial Child Youth and Family Services program was described as insufficient to meet existing needs and members stated that, in general, there were not enough services offered for children or that the programs were not offered on a consistent basis.

The Labrador-Grenfell Regional Health Authority acknowledged the challenge of meeting the current demand for services and predicted that the Project would affect health services, including public health, medical care and acute care services, due to anticipated population and economic growth in the area. The Health Authority also requested that Nalcor provide dedicated funding to ensure a timely response to increased service demands.

The provincial Department of Finance responded to statements regarding the responsibility of Nalcor to assist in providing community and health services, stating that it would not be appropriate for Nalcor to spend money on areas that are more appropriately in the purview of the Province to determine priorities. The Department stated that the Province had identified education, health and infrastructure as significant provincial priorities in the near future. Many participants countered that the revenues from the Project should follow an adjacency principle and funds should be spent in a manner that protects against adverse impacts on community life and services.

The Nunatsiavut Government noted that Inuit make frequent use of social programs in the Upper Lake Melville area and that in-migration to Happy Valley-Goose Bay from coastal communities would exacerbate the existing problems with health care capacity. It also recommended that social housing, increased counselling services, daycare programming, elder care and other social programs be put in place to minimize the social problems that may occur with an influx of a large number of people to the Happy Valley-Goose Bay area.

13.2.3 Panel Conclusions and Recommendations

In reaching its conclusions on community services, the Panel considered the following factors to be particularly relevant:

- existing health and social services shortfalls in Happy Valley-Goose Bay and Sheshatshiu, including the absence of drug and alcohol detoxification facilities and a wait list for mental health and addictions services;
- potential for higher levels of in-migration than predicted by Nalcor; and
- concerns regarding the capacity of community services to adjust to increased demand.

As noted earlier, the Panel expects that in-migration levels would exceed Nalcor's predictions. Given the inability of existing health and social services to meet current demand, any amount of in-migration because of the Project would further exacerbate the situation. As noted in Section 13.1.3, there is the potential that high wage employment associated with the Project would lead to an increase in alcohol and drug abuse and related family violence. This too would place

additional demand on health and social services. The Panel concludes that Project-related immigration and adverse social effects would have an adverse effect on the availability of health and social services, affecting residents of the Upper Lake Melville area and the coastal communities which also depend on these services.

The Panel observes that the provincial Department of Health and Community Services has the mandate to provide services, including mental health and addictions counselling, to address these issues, and that additional resources would be required to respond to any increase in demand because of the Project. To the extent that the needs assessment identifies the increased demand as Project-related, Nalcor would have responsibility to contribute financial resources to address the mitigation. This could be clarified through a Memorandum of Understanding with the Labrador-Grenfell Regional Health Authority.

RECOMMENDATION 13.5 Health and social services

The Panel recommends that, if the Project is approved, the provincial Department of Health and Community Services formally commit to provide the human resources required to address any Project-related increases in the demand for mental health, addictions and other health and social services at the Labrador Health Centre, as identified in the needs assessment. Nalcor's contribution to mitigation measures to address this should be clarified through a Memorandum of Understanding with the Labrador-Grenfell Regional Health Authority.

The Panel recognizes that the economic activity in Happy Valley-Goose Bay that would result from the Project could increase the types of services available in the community but could also place upward pressure on the cost of some goods and services, which would have an adverse effect on low income earners. It is difficult to forecast the extent to which either of these effects would occur.

13.3 COMMUNITY INFRASTRUCTURE

13.3.1 Nalcor's Views

Nalcor's socio-economic assessment also studied effects related to physical infrastructure and services. According to Nalcor, most effects would occur during construction and would be primarily associated with the following:

- movement of personnel and some material and equipment through the Goose Bay airport;
- movement of materials and equipment through the port of Goose Bay;
- movement of personnel, materials and equipment by road through Happy Valley-Goose Bay;
- use and development of industrial and commercial land in Happy Valley-Goose Bay; and
- increased demand on physical infrastructure and services arising from Project-related immigration.

Nalcor anticipated that most of these interactions would be in the Upper Lake Melville area and fewer interactions would occur beyond.

Nalcor stated that there would not be increased demand on infrastructure and services, education, or housing because of the Project, due to limited interaction between Project workers and the community of Happy Valley-Goose Bay. To reduce the effect on the Goose Bay airport, which is already operating at capacity, Nalcor indicated that it intended to create shifts where

people would move in and out of the camps on a daily basis as opposed to turning over the entire camp at one time.

Additionally, the EIS stated that the use of physical infrastructure in the area such as roads and the port facility in Happy Valley-Goose Bay during construction would not pose a concern but some upgrades to these facilities might be required. Nalcor stated that it would evaluate alternatives for shipping, including the possible use of facilities in Cartwright or Sept-Iles. Nalcor would work with the appropriate authorities to determine the requirements for the Project and upgrades would be completed by these authorities as needed.

Nalcor stated that accommodation provided for the Project would reduce demand on local infrastructure and services. The work camps would include recreational facilities, paramedic and emergency response as well as fire response. Water and wastewater treatment facilities would also be located on site. With respect to solid waste removal, Nalcor stated that it would use the landfill site in Happy Valley Goose Bay and pay tipping fees. Nalcor pointed out that because it is not a taxable entity and the Project's infrastructure is not located in the Town's limits, it would not be contributing directly to the Town's revenues.

Nalcor stated that if the Muskrat Falls facility is constructed first, as proposed, the construction of the Labrador-Island Transmission Link would occur concurrently. Nalcor stated that on-site accommodation would also be used for the transmission line construction.

In response to concerns regarding the existing housing crisis in Happy Valley-Goose Bay, Nalcor committed to work with the Newfoundland and Labrador Housing Corporation to help address this issue. Nalcor indicated that the use of accommodation complexes at the construction sites for both generation facilities would reduce the potential for adverse effects associated with a housing boom and bust effect and reduce in-migration into Happy Valley-Goose Bay.

Nalcor stated that no substantial differences in the effects on physical infrastructure would be expected with any change in sequencing and that the cumulative effect of the Project combined with future potential projects would be unlikely to exceed the capacity of existing infrastructure and services.

Nalcor responded to concerns related to the Project effects on groundwater quality by indicating that it was unlikely that there would be a significant effect and that compensation flow would prevent saltwater from entering the lower Churchill River during reservoir filling. Although there is the possibility for saltwater to travel three kilometres upstream without compensation flows, Nalcor evaluated the groundwater flows in the area and determined that even under these circumstances, saltwater would not migrate into the wells. During the public hearing, Nalcor committed to monitoring the groundwater of Mud Lake to ensure that there would be no saltwater intrusion resulting from the Project.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to community infrastructure included the following:

- provide self-contained accommodations to limit Project-related demands on community infrastructure;
- schedule rotational shifts on a daily basis to reduce congestion at the Goose Bay airport;
- coordinate and provide necessary support to the Port Authority if upgrades to the port in Happy Valley-Goose Bay are required;

- work with the Town of Happy Valley-Goose Bay on municipal planning issues to mitigate any issues that arise during construction;
- verify the saltwater intrusion model study to ensure that data match predicted values;
- monitor groundwater quality in Mud Lake during impoundment to confirm that saltwater intrusion has not occurred;
- provide potable water in the event that water in Mud Lake is adversely impacted by the Project; and
- monitor infrastructure capacity in conjunction with relevant government agencies throughout the life of the Project to assess whether additional infrastructure is required.

13.3.2 Participants' Views

Participants in the public hearing stated that given the scale of the Project, business infrastructure, regional housing, community infrastructure and regional transportation in Happy Valley-Goose Bay would be affected.

The Town of Happy Valley-Goose Bay noted that there is sufficient capacity for most municipal infrastructure such as water, sewer and landfill, to accommodate some increase in population; however, higher than expected in-migration could outstrip local capacity. The Mayor identified transportation infrastructure, such as roads, the airport, and the port facility, that may become overburdened because of the Project. The Mayor explained that the Town's budget was not adequate to mitigate the effects of the Project, and despite the explanation by Nalcor that the Province would assist the municipality with infrastructure needs, it was unclear how this assistance would be provided.

Effects on transportation infrastructure were also identified as an issue by the Central Labrador Economic Development Board, the Labrador North Chamber of Commerce, and the provincial Department of Innovation, Trade and Rural Development. These groups stated that the Project would increase traffic on the roads to and from Project sites and would therefore increase their deterioration. In particular, the Central Labrador Economic Development Board recommended that Nalcor cover the cost of paving and widening roads that would be used daily for Project construction. The Board also noted that the current communication infrastructure is unable to meet the demand for high-speed internet access in the Upper Lake Melville area.

Grand RiverKeeper Labrador Inc. referenced a study by Infrastructure Canada conducted in the Northwest Territories that stated that an increase in the number of residents and transient workers on construction projects created increased usage in the following areas: fire protection, recreational facilities, water, sewer, solid waste, land development, roads and local government. Grand RiverKeeper Labrador Inc. expressed concerns that these effects would be felt by the community of Happy Valley-Goose Bay because of the Project.

Concerns regarding the potential for saltwater intrusion in wells during the low flow periods of impoundment were expressed by Mud Lake residents. The provincial Department of Environment and Conservation concurred with Nalcor that saltwater might move into the river during impoundment, but that saltwater intrusion in the wells in Mud Lake was unlikely given the proposed compensatory flow. The Department recommended that a groundwater monitoring program be implemented to confirm the predictions.

Natural Resources Canada indicated that properties within the Town of Happy Valley-Goose Bay that are situated near riverbanks with stable shorelines may be affected by bank erosion as a result of changes in the river channel pattern and recommended that a shoreline erosion

monitoring program be established. Implementation of mitigation measures, such as placing rip-rap along the shorelines, might also be necessary if the erosion of properties becomes a concern. Bank erosion is also addressed in Chapter 7.

A number of presenters recommended that Nalcor consider upgrading town services as opposed to having self-sustained services within the Project camps.

The provincial Department of Innovation, Trade and Rural Development identified itself as the lead department in identifying infrastructure requirements for the Project. It stated that it would work with the municipal government and the provincial Department of Municipal Affairs to determine critical infrastructure priorities.

The provincial Department of Labrador and Aboriginal Affairs expected that there would be significant growth in services and infrastructure in Labrador because of the Project. Other participants noted that the expansion of existing businesses and the additional new economic activity would increase the demand for commercial and industrial land use for manufacturing facilities, retail space, warehousing and storage yards.

Many participants expressed concerns related to the effects of the Project on the existing housing shortage in Happy Valley-Goose Bay. Town representatives and residents stated that, based on previous construction projects, population would inevitably increase, which would create demand for housing and building lots. They stated that new land development and zoning issues needed to be dealt with to prepare for the increased pressure on housing. The Town of Happy Valley-Goose Bay pointed out that one third of the Town's land is Crown-owned and that the process to release it for development is time consuming.

The Nunatsiavut Government stated that because the vacancy rate in Happy Valley-Goose Bay is currently very low, even small amounts of in-migration would place pressure on the accommodation market and increase rental rates in the area. Many participants claimed that the Project would also have a boom and bust effect on housing.

The Melville Native Housing Association and the NunatuKavut Community Council identified effects on Aboriginal people with respect to housing. They stated that Aboriginal people on a minimum wage income currently face major challenges to find affordable housing and that there are 45 families on the waiting list. They predicted that the demand for housing units in the area would continue to increase, and purchase and rental prices would rise, thereby increasing the strain on low-income families, and Aboriginal families living in poverty. The Mokami Status of Women Council also expressed concerns that the housing issue in Happy Valley-Goose Bay would get worse and suggested that housing at the 5 Wing Goose Bay Military Base could be used as permanent, affordable housing for residents.

The Deputy-Mayor of the Town of North West River expressed concern that the concurrent construction of the Project and the transmission lines to the Island would bring an influx of workers, which would increase demands on services and infrastructure in North West River. Community infrastructure is already overloaded and would require improvement in the areas of electrical power distribution communications, internet, sewage and water treatment, health and social services, recreation and cultural services, and residential land development to address any increase in demand.

In addition, in order to assist other communities and to maintain its own services in the case of a catastrophic event such as a dam break, North West River would require generators for public buildings, emergency power, an emergency information system and a communication system.

Residents of Cartwright pointed out that the road connection between Cartwright and Happy Valley-Goose Bay would make the Port of Cartwright the logical and most economically viable shipping destination for materials and equipment required for the Muskrat Falls portion of the Project.

13.3.3 Panel Conclusions and Recommendations

In reaching its conclusions on community infrastructure, the Panel considered the following factors to be particularly relevant:

- existing housing shortage in Happy Valley-Goose Bay;
- potential for higher levels of in-migration than predicted by Nalcor;
- concerns regarding the capacity of community infrastructure to adjust to increased demand;
- concerns regarding saltwater intrusion in wells; and
- the effect of concurrent construction of the Muskrat Falls and Gull Island facilities and the transmission lines to the Island.

From an infrastructure perspective, the effects of the Project would be greatest during Project construction and would be experienced primarily in Happy Valley-Goose Bay due to its proximity to the worksites, particularly the Muskrat Falls facility, and its role as the transportation and service hub for the Upper Lake Melville area. The pressure on local infrastructure would be related in part to the shipping route selected by Nalcor for Project materials. If the port in Happy Valley-Goose Bay is used, the port would have to be upgraded and there is the potential that all materials would come through the town enroute to the construction sites. Use of Sept-Iles or Cartwright port would not require transit through the town and would reduce wear and tear on the local roads.

The demand for other municipal infrastructure, including water, sewer, landfill and recreation facilities, would depend largely on the level of in-migration. As noted earlier, the Panel expects that in-migration would exceed Nalcor's predictions, but it is not possible to determine to what extent.

The Labrador-Island Transmission Link project also has the potential to increase in-migration in Happy Valley-Goose Bay during the portion of the construction that would occur close to the community. Although very limited information was provided to the Panel about this project, any movement of materials and supplies through the community or in-migration associated with its construction would increase the pressure on local infrastructure.

The Panel notes that the Project could potentially relieve existing infrastructure constraints in Happy Valley-Goose Bay by providing additional capacity for internet access and a nearby source of additional hydroelectric power.

The Panel is aware that some infrastructure requirements, such as possible upgrades to the port in Happy Valley-Goose Bay or Black Rock Bridge, the construction of new roads for evacuation purposes and effects such as additional wear and tear on local roads from heavy truck traffic, would be directly attributable to the Project. Other effects, such as in-migration resulting from the backfilling of local job vacancies would be an indirect result. To determine the effects of the Project on local infrastructure, it would be necessary to identify existing infrastructure capacity and use and to then monitor that use throughout Project construction. During operations, it is unlikely that there would be any additional pressure on the municipal infrastructure unless Project-related riverbank erosion threatens shoreline properties and requires rip-rapping. This would be identified through the shoreline erosion monitoring program

to which Nalcor has committed. However, the Panel notes that no resources were identified to implement mitigation if necessary.

Given the uncertainty regarding the extent and nature of future development in the Upper Lake Melville area, and Happy Valley-Goose Bay in particular, the Panel recognizes that the economic "boom" that would occur because of the Project could well be followed by a marked downturn in economic activity once the construction period is complete. Reduced property and business tax revenue because of an economic "bust" would have an adverse impact on the Town's ability to meet its municipal infrastructure and service needs.

The Panel notes that several provincial government departments, including Labrador and Aboriginal Affairs, Innovation, Trade and Rural Development and Municipal Affairs have a role to play with respect to ensuring infrastructure and services needs are met but that no provincial government departments have made any firm commitments of financial resources for that purpose.

The Panel recognizes that, in addition to the infrastructure implications, the Project would impose additional administrative requirements on the Town of Happy Valley-Goose Bay. These could include infrastructure monitoring, the development of an emergency preparedness and evacuation plan, and a low-income housing strategy.

The Panel concludes that the Town of Happy Valley-Goose Bay would require dedicated resources to mitigate the additional administrative and infrastructure requirements imposed by the Project.

RECOMMENDATION 13.6 Capacity agreement with Happy Valley-Goose Bay

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador and Nalcor negotiate a capacity agreement with the Town of Happy Valley-Goose Bay to provide financial resources to increase the Town's capacity to address additional administrative demands related to the Project. The time period for the agreement would be negotiated by the parties and should relate to the needs expected at different stages of the Project. The resources would be intended to enable the Town to:

- establish baseline data on infrastructure capacity and use prior to the start of construction;
- monitor Project-related infrastructure effects throughout the construction period of the Project and identify needed mitigation;
- prepare, publicize and update on a regular basis, emergency preparedness plans to address the possibility of a catastrophic flood event;
- prepare a low income housing strategy; and
- address issues related to Project-related in-migration and the potential economic downturn at the end of the construction phase, and any other Project-related effects within the Town, not otherwise mitigated.

RECOMMENDATION 13.7 Funding for infrastructure mitigation

The Panel recommends that, prior to Project sanction, a binding and firm commitment be given by Nalcor and the Government of Newfoundland and Labrador that sufficient funds and resources be made available to fully mitigate Project-related adverse impacts on infrastructure in Happy Valley-Goose Bay.

Housing

The area of greatest infrastructure concern related to the Project appears to be the existing housing shortage in Happy Valley-Goose Bay. The demand for additional housing because of the Project would be directly linked to the level of in-migration that would ensue and, as noted earlier, this could in turn be affected by concurrent construction of the Labrador-Island Transmission Link.

Many residents of Happy Valley-Goose Bay expressed concern about the impact of the Project on the already high cost and low availability of housing. The Town described the challenge they face getting Crown land released for development of additional housing lots. The Panel notes that uncertainty regarding the sanction of the Gull Island development and the resultant duration of the construction period may act as a constraint on additional housing development if developers are unwilling to invest in what may be a relatively short-term "housing boom".

Access to low-cost housing is currently a challenge in Happy Valley-Goose Bay currently and any increase in demand and prices related to the Project would make access even more difficult for those in need. The Panel recognizes that Aboriginal people and single parent women are often the most vulnerable in housing shortages. The Melville Native Housing Association's report that there are currently 45 families on a waiting list for low-income housing highlights the extent of the current problem. The Melville Native Housing Association is seeking funding to perform maintenance on its existing units and has no resources to build additional housing. The Newfoundland and Labrador Housing Corporation also manages low-cost housing in Happy Valley-Goose Bay and Nalcor indicated a willingness to work with it to address this issue. The possibility of accessing vacant housing located at 5 Wing Goose Bay Military Base was raised by a number of participants as a possible approach to help resolve the housing shortage.

The Panel concludes that the Project and higher than predicted levels of in-migration as a result of coastal resident relocation and local employment backfilling would have an adverse effect on the availability of low-income housing in Happy Valley-Goose Bay.

Possible mitigation measures to address the increased strain on low-income housing availability include negotiating access to 5 Wing Goose Bay Military Base unoccupied housing and allocation of resources to Newfoundland and Labrador Housing Corporation or the Melville Native Housing Association to build additional low-income housing.

RECOMMENDATION 13.8 Low-income housing strategy

The Panel recommends that, if the Project is approved, before construction begins, Nalcor support the efforts of the Town of Happy Valley-Goose Bay, relevant federal and provincial departments, and local low-income housing agencies, to develop and implement a strategy to set measurable targets, address the existing low-income housing needs and mitigate the adverse impacts of Project-related in-migration on low-income housing.

The Panel concludes that, provided the recommended mitigation and monitoring measures are implemented, the adverse effects of the Project on community services and infrastructure are not likely to be significant.

13.4 HUMAN HEALTH, COUNTRY FOOD AND MERCURY

13.4.1 Nalcor's Views

Nalcor stated that methylmercury exposure associated with drinking water from the reservoir and river after reservoir creation would not pose a direct risk to human health. Bioaccumulation of methylmercury in fish, however, was expected to lead to levels exceeding Health Canada's limit for mercury concentrations in fish of 0.5 milligrams per kilogram in commercially sold fish. The species that would be affected are listed in Table 7.

Nalcor stated that fish consumption advisories would be implemented to reduce human exposure to methylmercury. Nalcor completed an interim Human Health Risk Assessment to assess the potential human health risk associated with mercury exposure and to predict potential fish consumption advisories (Table 7). This Human Health Risk Assessment evaluated potential risks to infants, toddlers, children, adolescents, adults and women of childbearing age who may be exposed to higher levels of mercury resulting from the Project. It concluded that human health concerns related to inorganic mercury and methylmercury exposure were considered to be low to likely negligible for all communities considered under baseline conditions. After impoundment, in the absence of consumption advisories, toddlers in Sheshatshiu who consume fish with predicted peak mercury concentrations would have elevated risks, whereas risks to all other communities would be low to likely negligible.

Nalcor stated that the interim Human Health Risk Assessment applied conservative assumptions where there were uncertainties and the results of the assessment were likely conservative and over-predicted potential exposures and risks. Nalcor stated that a final Human Health Risk Assessment would be completed after Project sanction, using available baseline mercury data from previous studies and collecting additional baseline human mercury data.

Table 7. Fish advisory levels (meals/month) presented in the interim Human Health Risk Assessment (Source: Nalcor)

Fish Species (fish length)	[methylmercury] _{Fish} (mg/kg ww)	Toddler	Child	Adolescent	Adult	Pregnant Woman
Brook trout (300 mm)	0.5	2.0	2.4	8.6	10.2	3.7
Ouananiche (300 mm)	0.5	2.1	2.4	8.8	10.4	3.7
Lake trout (600 mm)	2.2	0.5	0.5	1.9	2.3	0.8
Northern pike (700 mm)	1.8	0.5	0.6	2.3	2.7	1.0
Lake whitefish (400 mm)	0.9	1.1	1.3	4.6	5.5	2.0
Longnose sucker (400 mm)	0.8	1.2	1.4	5.2	6.2	2.2
White sucker (400 mm)	0.6	1.7	1.9	7.0	8.3	3.0

Nalcor stated that the final Human Health Risk Assessment would include a quantitative assessment of the amount of mercury that local residents in Aboriginal and non-Aboriginal communities might be exposed to and the risks associated with that exposure. Exposure of community members to mercury would be determined by measuring levels of mercury contained in samples of hair from individuals and meat from food sources, such as fish and seals. For the final Human Health Risk Assessment, Nalcor committed to conducting food consumption surveys and human hair sampling in the communities of Mud Lake, North West River, Happy Valley-Goose Bay, Churchill Falls and Sheshatshiu. Nalcor did not believe there was a threat to human health from mercury into Lake Melville. However, Nalcor further stated

that it would also monitor mercury in fish and seals in Lake Melville and depending on the results, food consumption surveys and hair sampling in other communities such as Rigolet would be considered. Nalcor stated that it initiated baseline sampling programs of seal tissues in spring 2011, including muscle and liver, to help inform consumption advisories that would be needed if mercury accumulation in seals is observed.

If the Project is approved, Nalcor would continue to monitor mercury levels in fish in the reservoirs, and in fish and seal downstream of Muskrat Falls in Goose Bay and Lake Melville, to inform the associated consumption advisories and would consult government agencies, local communities and Aboriginal groups to effectively communicate advisories specific to each fish species and for seal, as appropriate. Nalcor concluded that consumption advisories would likely be required for the lower section of the Churchill River and downstream to Goose Bay, but would likely not extend beyond this area.

Consumption advisories would include information about the risks and benefits of fish consumption along with a description of the types of fish that are to be avoided. Nalcor determined that this might result in decreased fish harvesting and consumption. However, Nalcor also indicated that fishing currently mostly occurs in Lake Melville or in tributaries of the Churchill River, outside of the area where fish consumption advisories would likely be implemented. Nalcor provided examples of decreased contaminant load in people when consumption advisories were communicated effectively and clearly and when community members were involved in the process.

In response to Health Canada's concerns regarding the treatment of hazard quotients in the interim Human Health Risk Assessment, Nalcor agreed that any hazard quotient value over 1 was of potential concern to human health, but stressed that the risk of health effects was low, that more detailed baseline information would be gathered following sanction of the Project with a focus on the population of concern, and extensive monitoring and mitigation programs would be designed to ensure that mercury exposure would not produce unacceptable risk to human health. In addition, Nalcor stated that it would cooperate with Health Canada in finalizing the Human Health Risk Assessment and in designing consumption advisories and communications strategies to ensure that its proposed mitigation strategy was appropriate and effective.

In response to participant concerns regarding the potential carcinogenic effects of methylmercury, Nalcor presented information stating that there were no known cancerous effects and that Health Canada did not consider methylmercury as a carcinogen.

Country Food

Nalcor stated that there were limited mercury data available on sources of country food consumed by local residents and no baseline sampling of country food other than fish was done for the EIS. However, Nalcor measured mercury concentrations in the feathers of osprey, to provide an indication of potential mercury levels in higher-order predators that consume fish. In the EIS, several species, including moose, black bear, beaver, marten, Canada goose, surf scoter, osprey, wetland sparrows, and Harlequin duck, were considered potentially at risk of methylmercury contamination as their food chains include aquatic vegetation and, in some cases, fish.

In the interim Human Health Risk Assessment, Nalcor stated that several of these species may be consumed as country food and their consumption was considered a potential contributing factor to mercury exposure, in addition to exposure through the aquatic food chains. Although Nalcor did not study the baseline mercury levels of country food within the Project area, it did provide a literature review of mercury levels reported in adjacent areas. These studies indicated

that mercury may reach high levels (> 0.5 milligrams per kilogram) in fish-eating species of birds and both terrestrial and aquatic mammals. In Quebec, levels of mercury were found to be potentially hazardous for consumers of flesh and livers of piscivorous ducks, mink, beluga whale, freshwater seals and the kidneys of the George River caribou herd. Liver and kidneys in aquatic mammals were reported to have particularly high levels of mercury (i.e. 0.93 to 15.03 milligrams per kilogram for ringed seal liver and 2.6 to 55.0 milligrams per kilogram for freshwater seal liver). Nalcor also stated that all country food other than fish were assumed to have mercury present as inorganic mercury, which presents a lower risk to human health than methylmercury.

Country food consumption rates for wild game, including mammals and birds, were reported by Nalcor in the interim Human Health Risk Assessment for adults in the Innu community of Sheshatshiu. Country food was not, however, included in the interim Human Health Risk Assessment's predictions of peak mercury because of Project effects, nor was human consumption of marine mammals assessed.

Cumulative Effects

Nalcor stated that the cumulative effect of placing additional hydroelectric generation stations in the Churchill River system on fish and country food consumption would be dependent on the communication of consumption advisories and the response of users to these advisories. It stated that fish consumption advisories, when meaningfully communicated, have been shown to be effective.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to methylmercury included the following:

- complete a Final Human Health Risk Assessment to assess the potential human health risk associated with mercury exposure, addressing Health Canada's modelling concerns regarding meal size and frequency of consumption;
- consult government agencies, local communities and Aboriginal groups to effectively communicate advisories for specific fish species and for seal, as appropriate;
- collect additional baseline data on mercury by conducting a food consumption survey and hair sampling in the communities of Mud Lake, North West River, Happy Valley-Goose Bay, Churchill Falls and Sheshatshiu;
- monitor baseline methylmercury data in fish and seal in Lake Melville and, depending on the results, consider the possibility of conducting food consumption surveys and hair sampling in other communities, such as Rigolet; and
- monitor methylmercury levels after impoundment in fish in the lower Churchill River, Goose Bay and Lake Melville and in seal downstream of Muskrat Falls to inform consumption advisories.

13.4.2 Participants' Views

A number of government agencies, including Fisheries and Oceans Canada, Natural Resources Canada, Environment Canada and Health Canada submitted presentations at the hearing regarding methylmercury. Participants in many different communities expressed concerns that consumption of fish and country food with elevated methylmercury concentrations would represent a risk to humans and wildlife. In addition, several participants expressed concerns that elevated methylmercury levels would extend downstream of Muskrat Falls,

outside of the area assessed by Nalcor, and would potentially affect human health through the consumption of fish and country food, such as seal. Aboriginal groups in particular expressed concern about the effects of methylmercury on animal and human health. Participants wanted information on the length of time fish in the lower Churchill River would contain methylmercury due to the Project and the nature of the effects on humans and animals.

Both Sierra Club Atlantic and Grand RiverKeeper Labrador Inc. submitted materials stating that methylmercury exposure may increase the risk of cardiovascular disease in humans, particularly adult men.

Natural Resources Canada noted that, although advisories have become standard practice, it is a mitigation measure that is introduced only after a mercury problem has been discovered. The Department questioned whether it was acceptable as the only proposed mitigation measure.

In regards to potential risks of methylmercury from consumption of country food, Health Canada stated that it only assessed methylmercury intake with respect to fish consumption but indicated that studies have been conducted on methylmercury in country food elsewhere in northern Canada on species such as loon, seal, whale and big game. The Department explained that approximately 95 percent of the mercury in muscle of wild game was found to be in the form of methylmercury, but that organ meats contained primarily inorganic mercury due to the demethylating function of the liver. Fisheries and Oceans Canada clarified that this was not the case for marine mammals and that organ meats in seal contain primarily methylmercury.

Health Canada did not agree with Nalcor's use of the geometric mean value for fish consumption and recommended that both the mean and upper estimates, such as the 90-95th percentile, should be used to ensure a conservative approach that included people consuming the greatest amount of fish.

In addition, Health Canada disagreed with Nalcor's calculation of methylmercury exposure using smaller meal sizes for North West River, Churchill Falls, Happy Valley-Goose Bay and Mud Lake than for Sheshatshiu. It also disagreed with Nalcor's classification of hazard quotients between one and ten as low to negligible risk given that long-term exposure to methylmercury by sensitive subpopulations, such as toddlers, children and women of child-bearing age, was anticipated. Instead, it recommended that if hazard quotients were greater than one, the appropriate risk management strategy should be the issuance of fish consumption advisories.

Based on its evaluation of Nalcor's interim Human Health Risk Assessment for the consumption of fish, Health Canada questioned the consideration of fish as the only dietary source of methylmercury in the future exposure scenario because this approach would underestimate exposure from other sources of country food. The Department also indicated that it had low confidence in results from community surveys regarding fish consumption frequency and species-specific consumption rates due to low survey response rates.

Health Canada recommended that Nalcor recalculate fish consumption rates, species-specific consumption rates, and estimated daily intakes of methylmercury for the reasons noted above. Health Canada also stated that fish consumption advisories and communications regarding advisories should be appropriately developed and delivered in consultation with local communities and Aboriginal groups to allow these groups to modify fish selected for consumption rather than decreasing overall fish consumption. If the Project is sanctioned, Health Canada also offered to assist Nalcor in the design and implementation of mercury monitoring in humans.

Sierra Club Atlantic stated that fish consumption advisories were not adequate or appropriate mitigation to reduce or eliminate potential effects of methylmercury produced by the Project on human health. Its position was that fish consumption advisories would not lessen environmental effects and would instead shift the responsibility for mitigation to consumers.

During the public hearing, an Innu participant recalled her discomfort and sadness when she saw a fish consumption advisory sign for the first time after the development of Churchill Falls. Another participant stated that there were no fish consumption advisory signs at Gull Island and questioned whether people fishing at that location knew about the current advisories.

Innu Nation recommended that Nalcor use researchers from the Université du Québec à Montréal who have done previous blood and hair sampling as they have developed a trusted relationship with the community.

The Nunatsiavut Government submitted information regarding the relatively high concentration of mercury in seal liver compared to other sources of country food. It also considered that even if predicted elevated methylmercury levels are not actual risk factors as measured by Nalcor or government authorities, poor diet choices could be made if Inuit believe that the benefit of consuming country food is compromised by the Project. A participant also mentioned that harvesters in Goose Bay or Lake Melville would not be able to determine if and how much seal are contaminated with methylmercury, making country food a risky choice.

In Rigolet, participants stated that they felt that methylmercury in fish would harm the people of their community. Participants explained the importance of seal as a food source and expressed concern about the difficult choices mothers would need to make regarding whether or not to breastfeed their children or feed them fish or seal meat. Participants in Nain and Rigolet described their use and consumption of seal liver as a preferred meat. A participant stated that the Inuit are at high risk for adverse effects from methylmercury exposure due to their high country food consumption rates and elevated mercury in fish even before reservoir flooding. Community participants recommended that Nalcor study methylmercury levels in fish and seal, including near Rigolet.

The Nunatsiavut Government stated its disappointment that the interim Human Health Risk Assessment did not include Inuit communities such as Rigolet, feeling in particular that impacts on seal and potential impacts from human consumption of seal meat had been overlooked in the EIS. It recommended that Nalcor develop a specific communication plan for elevated concentrations of methylmercury in the lower Churchill River and Lake Melville in partnership with and to the satisfaction of all groups, especially Aboriginal groups, which have a culture and lifestyle heavily dependent on country food. It further recommended that Nalcor engage other expert groups, such as the Northern Contaminants Program of Aboriginal and Northern Affairs Canada, that have already established lessons learned and best practices with respect to effective contaminant communication for Inuit communities.

The Nunatsiavut Government also recommended that Nalcor conduct the same country food and human mercury sampling as was conducted previously as part of the Inuit Health Survey.

A North West River resident stated that the one sign on the river warning people of the dangers of consuming the fish was not enough, and not enough had been done to notify people of the mercury problems resulting from the Churchill Falls development. Another participant stated that the fish, seal and fish-eating birds would again become too contaminated with methylmercury to be safely consumed for another generation.

A resident of Mud Lake felt that the best way to communicate consumption advisories in Mud Lake would be through public meetings.

A number of other participants expressed concern or were confused about the health effects of methylmercury on humans and thought that methylmercury was carcinogenic.

Cumulative Effects

Many participants were concerned about the length of time that fish and wildlife would be contaminated with methylmercury and the cumulative effects of the Churchill Falls and Lower Churchill projects combined. Participants expressed a loss of faith in country food and decreased fish quality due to past experiences with the Churchill Falls project. Participants were concerned with the following in particular:

- long-term low-level exposure to methylmercury;
- uncertainty in the protectiveness of consumption advisories;
- the possibility that some residents would not resume fishing in the Churchill River when current consumption advisories are lifted;
- the potential that people would no longer trust the quality of country food and eat less of it;
- the possibility that a change in diet due to less harvesting or a decline in the quality of country food would have health consequences;
- the possible contamination of other country food, other than fish; and
- the possible contamination of the water and the Churchill River as a whole.

13.4.3 Panel Conclusions and Recommendations

In reaching its conclusions on human health, country food and mercury, the Panel considered the following factors to be particularly relevant:

- evidence that elevated methylmercury levels in rainbow smelt, tom cod and sea trout in Goose Bay and western Lake Melville were linked to the Churchill Falls development;
- potential for methylmercury to affect fish and seal downstream of Muskrat Falls, in the Goose Bay estuary and Lake Melville, for extended periods of time;
- importance to Upper Lake Melville and Rigolet residents of fishing and seal hunting in Goose Bay and Lake Melville for food, cultural and recreational purposes;
- literature reports of high baseline mercury values in country food such as seal and caribou; and
- potential for changes in country food consumption and for human health effects due to long-term low-level mercury exposure and consumption advisories.

Mercury and Consumption Advisories

The Panel notes that methylmercury production is an inevitable result of reservoir impoundment and that the consumption of fish or country food contaminated with methylmercury can pose risks to human health, particularly in young children. The Panel is also aware that fish and country food, such as caribou and seal, remain an important part of many Labrador and Quebec Aboriginal and many non-Aboriginal peoples' diets for both health and economic reasons. With very high rates of diabetes among Innu in particular, the value of fish and country food as an alternative to highly processed, store-bought food cannot be overstated.

Nalcor has acknowledged that methylmercury production because of reservoir impoundment and its bioaccumulation in fish may lead to consumption advisories in the reservoirs and lower Churchill River. Nalcor does not anticipate that consumption advisories would be required beyond the mouth of the river. However, based on the evidence submitted, uncertainty remains regarding the fate of mercury in the river and the possibility that consumption advisories would be required. As described in Chapter 6, the Panel has recognized the potential for mercury effects to be felt as far downstream as Goose Bay and Lake Melville and has recommended additional study to clarify the risk level. In its review of land and resource use and current aboriginal land and resource use for traditional purposes, the Panel acknowledged the importance of Goose Bay and Lake Melville as sources for fish and seal for Upper Lake Melville and Rigolet residents, as well as destinations for traditional fishing, hunting and boating activities. The Panel notes that these areas have never been subject to fish consumption advisories in the past, although the recent evidence from Fisheries and Oceans Canada suggests that fish were contaminated with methylmercury in these areas as a result of the Churchill Falls development.

Residents have expressed great concern regarding the potential that this source of food and the basis for traditional activities could be contaminated because of the Project. Should this occur, the Panel recognizes that there is no biophysical mitigation possible for this effect.

The Panel concludes that, if consumption advisories are required in Goose Bay and Lake Melville as a result of elevated methylmercury in fish or seal from the Project, this would constitute a significant adverse effect on the residents of the Upper Lake Melville communities and Rigolet.

If advisories are required in Goose Bay and Lake Melville, it is the view of the Panel that Nalcor should be required to negotiate mitigation and potential compensation measures with respect to the effects of consumption advisories with residents who would be affected by them.

RECOMMENDATION 13.9 Possible requirement for consumption advisories in Goose Bay or Lake Melville.

The Panel recommends that, if the Project is approved and the outcome of the downstream mercury assessment (Recommendation 6.7) indicates that consumption advisories would be required for Goose Bay or Lake Melville, Nalcor enter into negotiations prior to impoundment with the parties representing – as appropriate – Goose Bay and Lake Melville resource users. Depending on where the consumption advisories would apply, these could include Aboriginal groups, the Town of Happy Valley-Goose Bay, Mud Lake Improvement Committee, the Town of North West River and the community of Rigolet. The purpose of the negotiations would be to reach agreement regarding further mitigation where possible and compensation measures, including financial redress if necessary. This recommendation would also apply later in the process if the downstream mercury assessment indicated that advisories were not likely, but monitoring subsequently required their application.

Nalcor has committed to monitor mercury in fish and seal for a minimum of ten years after impoundment. If levels of methylmercury rise to the point that consumption advisories would be required, Nalcor would work with Health Canada and local health care organizations to develop and implement them. The Panel supports Health Canada's recommendations regarding a more conservative approach to measuring fish consumption and hazard quotient levels to guide the issuance of consumption advisories.

Nalcor has demonstrated an understanding of the importance of communicating information regarding both the risks and the benefits of fish consumption and has agreed to work with government agencies, local communities and Aboriginal groups to ensure effective communication. The Nunatsiavut Government noted that Aboriginal Affairs and Northern Development Canada has developed best practices for contaminant communication that could be applied. The Panel recognizes the complexity and challenge of communicating safe levels of consumption for multiple fish species and multiple age groups and supports a careful review of lessons learned elsewhere.

Nalcor has submitted an interim Human Health Risk Assessment and if the Project proceeds, it would follow-up with a consumption survey and human hair mercury testing for residents of Churchill Falls and the Upper Lake Melville communities to establish baseline levels. Although it has committed to monitoring mercury in fish and seal in Lake Melville, it has not included the community of Rigolet in its plans for baseline mercury testing in humans. Given the potential for methylmercury to bioaccumulate in seal in Lake Melville, the fact that seal is a major food source for Rigolet residents, and the possibility that Rigolet residents have been exposed to mercury from other sources, the Panel feels it is important to establish a baseline methylmercury level in this community as well.

The Panel notes that in a previous study of methylmercury concentrations in hair and its correlation with mercury intake from diet, there was inconsistency in the results for Innu participants. These inconsistent results call into question the efficacy of hair sampling for this population. The Panel also notes the sensitivity surrounding mercury testing, the appropriate communication of results and the importance of providing accurate and complete information to participants. Both the Nunatsiavut Government and Innu Nation have participated in previous research with respect to mercury and both groups have expressed an interest in providing input into how mercury monitoring is conducted in their communities.

In summary, the Panel notes the following points related to mercury and consumption advisories:

- fish and seal mercury monitoring would determine whether and where consumption advisories are required;
- varying levels of consumption advisories for multiple species of fish can be complex to interpret and could result in an overall reduction in the consumption of food beneficial to health;
- careful attention to effective communication and best practices would be required to mitigate this impact;
- consumption advisories may be required to prevent adverse effects on human health from methylmercury in fish, and potentially seal, in the Churchill River, Goose Bay estuary and Lake Melville; and
- human mercury monitoring should include the establishment of baseline levels and regular monitoring for residents of Churchill Falls, the Upper Lake Melville communities and Rigolet.

RECOMMENDATION 13.10 Consumption advisory implementation

The Panel recommends that, if the Project is approved and fish and seal monitoring indicates that consumption advisories are required, Nalcor:

- follow Health Canada guidelines regarding the establishment of human mercury hazard quotient levels and fish consumption advisories;
- consult with Aboriginal Affairs and Northern Development Canada regarding best practices for the communication of advisories;

- consult with Aboriginal groups and affected communities regarding an effective approach to the communication and implementation of consumption advisories that ensures that affected communities have an understanding of the quantities and types of fish that can be consumed safely and the health benefits of including fish in one's diet;
- ensure that notifications of the consumption advisories are placed at regular intervals in easily visible locations along the shorelines of affected water bodies;
- ensure that consumption advisories are updated as necessary to reflect any changes detected in mercury levels in fish or seal; and
- provide publicly accessible, up-to-date and accurate information through the internet, radio, newspapers and other means regarding the health risks of mercury and the status of the advisories.

It is estimated that methylmercury levels in fish resulting from impoundment would recede to baseline levels over a period of 30 to 35 years. Taking into account the Churchill Falls development, which caused elevated methylmercury levels in the Churchill River and Goose Bay estuary for the past 35 years, there is the potential that methylmercury levels in fish in the Churchill River could remain elevated for another 30 to 60 or more years depending on the time lag between the Muskrat Falls and Gull Island impoundments. Nalcor has indicated that the timing of the Muskrat Falls and Gull Island impoundments would not affect the peak level of methylmercury in fish. However, there is insufficient information available to determine the impact of prolonged, multi-generational and low-level exposure to mercury, if any, on fish and humans who eat the fish. The long-term nature of the mercury exposure because of the Project reinforces the importance of monitoring human mercury levels until it is clear that human health would not be at risk.

RECOMMENDATION 13.11 Human health and mercury monitoring

The Panel recommends that, if the Project is approved, Nalcor, in collaboration with Health Canada and the provincial Department of Health and Community Services:

- consult with Aboriginal groups and affected communities regarding the approach to be taken to baseline and follow-up mercury testing and the communication of results for each group; and
- establish baseline human mercury levels in Churchill Falls, Upper Lake Melville communities and Rigolet, with consideration given to offering blood tests as well as hair samples for Innu participants, due to inconsistencies noted in the correlation between hair sample results and dietary consumption.

If consumption advisories are required, it is further recommended that Nalcor ensure that a human health mercury monitoring program is established concurrently with the issuing of consumption advisories. This monitoring would continue until five years after the lifting of consumption advisories, or until such time as determined by Health Canada, and would be overseen by the Monitoring and Community Liaison Committee described in Chapter 15.

Mercury in Country Food

Information submitted by Nalcor in the interim Human Health Risk Assessment indicates that, in addition to methylmercury found in fish as a result of reservoir impoundment, various sources of country food, including George River caribou and Labrador seal, have been found to contain elevated levels of mercury. The assumption is that these elevated levels are the result of long-range transportation and deposition of contaminants, including mercury. Although the Human

Health Risk Assessment assumed that the mercury in country food was inorganic, and therefore less potentially harmful to human health, information from Fisheries and Oceans Canada and Health Canada indicates that the form of mercury in caribou muscle and seal organ meats is methylmercury. It is therefore possible that overall exposure to methylmercury and projected peak mercury levels may be greater than the estimates provided in the interim Human Health Risk Assessment Report as a result of the consumption of certain sources of country food.

In addition to the concern regarding the contribution of mercury in country food to overall methylmercury levels in humans, there is also the risk that an increasing awareness of mercury would reduce country food consumption to a level that could have deleterious effects on the health of Aboriginal people in particular. In an effort to better understand the contribution that country food currently makes to Aboriginal diets and to monitor changes in this that may be related to increasing awareness of mercury because of the Project, the Panel believes it would be important to incorporate dietary surveys as an integral part of the mercury monitoring program.

RECOMMENDATION 13.12 Dietary surveys

The Panel recommends that, if the Project is approved and consumption advisories are required as a result of mercury levels in fish or seal, Nalcor conduct ongoing dietary surveys as an integral part of the mercury monitoring program, including fish, seal, caribou and other country food. Dietary surveys should be conducted concurrently with regular mercury testing in affected communities to determine the effectiveness of the consumption advisories and the overall impact on fish and country food consumption.

The evidence of mercury in country food consumed by Labrador residents and the absence of consumption guidelines and data point to a broader issue of the overall safety of country food. This issue is a concern for residents of Labrador and could have application across northern Canada. Health Canada stated that it does not monitor mercury in country food, although it is involved in setting consumption advisories for other food sources. The Panel has identified this as an important issue that should be considered in the regional planning process, potentially within the mandate of the provincial Department of Labrador and Aboriginal Affairs, and more specifically, within the health component of the Northern Strategic Plan.

RECOMMENDATION 13.13 Research on mercury in country food

The Panel recommends that, if the Project is approved, the provincial Department of Labrador and Aboriginal Affairs, in consultation with Health Canada and Aboriginal groups, initiate a study of (a) the extent of country food contamination by mercury and other contaminants and (b) human consumption levels of country food, particularly in areas where people are also exposed to mercury in fish, to identify the potential risks to human health in Labrador.

13.5 PANEL OBSERVATIONS ON OTHER KEY COMMUNITY CONCERNS

The issues and concerns raised during the public hearing community sessions are outlined in Appendix 5. The Panel noted a number of common community-related themes that emerged from these hearings and provides its observations that may be useful to governments. These issues include the following:

- electrical power supply for Labrador coastal communities;
- disparity in financial benefits;

- redress for the effects of the Churchill Falls development for affected Quebec Aboriginal communities; and
- consultation with Aboriginal groups.

13.5.1 Electrical Power for Coastal Communities

The Nunatsiavut Government and the coastal communities of Cartwright, Rigolet, Natuashish and Nain expressed frustration with the limitations of the current diesel power service, including with respect to air emissions, noise, unreliability, inability to use it for heating, and associated constraints on business and other community facilities, such as recreational complexes, due to the high cost of energy. Many participants identified a connection between the proposed Project and what they see as outstanding power supply issues in the coastal communities – their complaint being that the Project would generate power solutions for the Island while long-standing Labrador power problems remained unaddressed. They expressed a desire for a speedy resolution to the limitations of diesel power and concern that the recent initiatives to study alternatives would be unlikely to lead to a timely solution.

Nalcor noted that it had an obligation to provide the lowest cost service, and options such as providing transmission lines from the Project to all coastal communities or adding an alternating current line to the direct current Project transmission would not meet that objective or were not technically possible. Nalcor also noted that there is a subsidy in place to reduce the cost of power in coastal Labrador communities.

The Panel observes that while coastal communities may not experience direct adverse effects from the Project, employment and training opportunities, while beneficial for some individuals and families, may tend to draw people away from the coastal communities, perhaps permanently. This could contribute to community destabilization. Finding an effective and renewable-based solution to the energy supply problems of these communities would strengthen them and assist local economic and community development. It would also provide a way to reduce greenhouse gas emissions, even though at a small scale, while at the same time providing another opportunity to create durable benefits in Labrador.

The Panel recognizes that this is a complex issue, and that different solutions may be required for different communities. A collaborative approach would be required to address the issue. The Panel was encouraged by the Nunatsiavut Government's offer to partner with the appropriate Nalcor division to find a solution for North Coast communities. Similar collaborations would be beneficial for Natuashish and the South Coast communities.

13.5.2 Disparity in Financial Benefits

The Panel notes that the Nunatsiavut Government, the NunatuKavut Community Council, a number of participants in North West River and Happy Valley-Goose Bay and the Aboriginal communities in Quebec expressed concern about the substantial financial and other benefits negotiated by Innu Nation and Nalcor in the *Tshash Petapen* Agreement and the absence of financial benefits for any other group. Nalcor has indicated that its decision was based on the existence of a land claim settlement within the Project area. The Panel is aware of the difference in the status of Aboriginal claims to rights and title in Labrador and that the impacts and benefits of the Project would vary among communities. All parties are encouraged to work toward solutions that are fair to all affected communities.

13.5.3 Churchill Falls Redress

The Panel heard descriptions of the adverse impacts of the Churchill Falls development and the creation of the Smallwood Reservoir from the Aboriginal communities in Quebec and from Upper Lake Melville residents. These included the flooding of traditional lands, loss of equipment and adverse effects on their traditional land use practices and the fact that they occurred without consultation or consent. Redress for Innu Nation has been addressed through the *Tshash Petapen* Agreement.

The Panel observes that this is a lingering issue. While resolving this issue would not necessarily be primarily Nalcor's responsibility, it would be important in establishing a relationship of trust and cooperation with communities affected by the proposed Lower Churchill Project.

13.5.4 Consultations with Aboriginal Communities

During the course of the environmental assessment process, Aboriginal participants raised concerns about the nature and adequacy of consultations by Nalcor and by the provincial and federal governments. The Panel has no mandate to assess the scope or nature of the Crown's duty to consult Aboriginal persons or groups, nor whether Canada or Newfoundland and Labrador had met its respective duty to consult and accommodate. The Panel's observations are based on what it heard about the history of the relationship between Aboriginal communities potentially affected by the Project and the various governments poised to make decisions about the Project.

Most of the Aboriginal communities which engaged in the environmental assessment process raised concerns about past developments and the absence or inadequacy of consultations. In some cases, communities reported that they had not been consulted at all. In other cases, they indicated that they were told the other projects would have no effect on them, but that those reassurances turned out to be wrong. It seems clear, in light of this, that the relationship between Aboriginal communities and the provincial and federal governments is strained in light of past developments.

The Panel heard concerns about the lack of consultations for the Churchill Falls project and the impacts felt by many Aboriginal communities, both in Quebec and Labrador, most of which stated that they have not been consulted or compensated for those impacts even to this day. Some communities have experienced other developments in Labrador and Quebec, such as other hydroelectric projects and mines, and similarly reported inadequate consultation, and no compensation for the impacts from these projects. One exception to this, in the eyes of a number of the Quebec Aboriginal communities, appears to have been the approach to consultation by Hydro-Québec for the Romaine hydroelectric project.

Many of the Aboriginal groups reported having been offered inadequate resources and time to gather evidence of how the Project would interact with their rights and title and with their current use of the Project area. A number of groups complained that Nalcor had approached their consultations in a very formal manner, and with a "take it or leave it" approach, rather than come to the communities with an open mind about how to meaningfully engage. Some groups reported language barriers, including problems with translation of important documents.

It is clear that Nalcor has made considerable effort with respect to consultation with Innu Nation and with consultation that led to consultation agreements with two other communities. Nalcor's decisions regarding the appropriate level of consultation with the Nunatsiavut Government were

based on Nalcor's exclusion of Lake Melville from the Assessment area. The Nunatsiavut Government indicated that it was unsatisfied by Nalcor's consultation.

The federal Aboriginal Consultation Framework has clearly not been universally welcomed. One group, the NunatuKavut Community Council, initiated a court action during the environmental assessment process, in part challenging this Framework and the adequacy of consultations. Other Aboriginal communities also expressed concern with the Framework, and with the consultation effort to date.

It is the Panel's suggestion that governments take the history and these concerns about the consultations into account in deciding on the appropriate approach to consultation with affected communities. The Panel observes that governments would be well advised to make every effort to meaningfully engage with Aboriginal communities before a Project decision is made, with a view to repairing strained relationships and develop relationships based on trust.

14 ACCIDENTS AND MALFUNCTIONS

The EIS identified accidents and malfunctions that could be caused by, or associated with, project activity. Nalcor discussed waste management (including spills of hazardous material), fires caused by project activity and dam failure.

During the public hearing, participants identified a breach or break in a dam and associated issues as the accident or malfunction of most serious concern.

14.1 NALCOR'S VIEWS

Waste Management

In the context of waste management, Nalcor addressed domestic garbage (waste generated at the accommodation complexes at Gull Island and Muskrat Falls), treated sewage and wastewater and construction waste.

The EIS noted that the construction Environmental Protection Plan would address standard procedures for handling these wastes. The likelihood of a vehicular accident (accident involving a garbage truck traveling from one of the sites to the landfill in Happy Valley-Goose Bay) was asserted to be small, based on provincial statistics, as was the likelihood of a release of untreated sewage. Nalcor indicated that the latter event was more difficult to estimate as no statistics were available.

In addition to the broader Environmental Protection Plan, Nalcor has committed to develop a series of comprehensive Safety, Health and Environmental Emergency Response Plans to identify responsibilities in the event of an unplanned accident, and to provide the information required for effective response and incident reporting.

Nalcor noted the requirements of provincial regulators respecting waste management, including, for example, certificates of approval for septic systems and waste management systems, and permits for fuel storage and transport of dangerous goods.

Spill of Hazardous Material

Nalcor noted that the most common hazardous material present at the Project site during construction, operation and maintenance would be hydrocarbon products. Other hazardous materials would include battery acid, concrete preparation fluids and alkaline materials. Explosives would also be stored on site. Nalcor asserted that spills of hydrocarbons (gasoline and diesel fuel) would be the most likely accident to occur, posing a threat to the environment. Nalcor indicated that construction, operation and maintenance Environmental Protection Plans would establish the procedures to be followed in the event of a spill, either during fuel transfer or as a result of a breach in storage containers. Nalcor asserted that the likelihood of a large spill was small and that small leaks and drips would be the more likely source of spills of these materials.

Activities associated with the storage, handling and transport of hazardous material are also subject to both federal and provincial regulation under the provincial *Environmental Protection Act* and the federal *Transport of Dangerous Goods Act*.

Forest Fires

Nalcor suggested that forest fires may occur during the construction phase of the project as a result of accidental ignition or vehicle collisions, through vegetation clearing in the reservoir or along the transmission line, by electrical/equipment malfunction or due to human error. Nalcor's Emergency Preparedness Plan will include a plan for combating forest fires. As well, Nalcor would ensure that sufficient firefighting equipment is provided on site to allow personnel to respond to an emergency. Personnel would also be trained in the use of this equipment. Nalcor noted however, that fire response for Labrador is the responsibility of the provincial Department of Natural Resources which maintains equipment and resources for this purpose.

Nalcor also provided details to support its view that the worst case fire would occur within the Muskrat Falls reservoir and burn to a maximum distance of 10km from the source and provided details of the potential environmental effects and proposed measures to reduce the effects of a potential fire within a generating station. Nalcor judged the likelihood of a forest fire attributable to project activities as unlikely.

Nalcor asserted that a forest fire caused by the project would have a moderate environmental effect and be reversible over the long term. Residual environmental effects on terrestrial fauna and the socio-economic Key Indicators were judged by Nalcor to be not significant. Nalcor has committed to develop a plan to prevent and combat forest fires that will assist in minimizing the occurrence and limiting the area burned by a forest fire.

Dam Failure

Nalcor identified two causes of dam failure: overtopping and dam breach. Overtopping occurs when water overtops the dam structure as a result of meteorological events, extreme wave action, blockage of discharge, etc. A dam breach occurs when the structure fails due to earthquakes, seepage or defects in design.

According to Nalcor, the consequences of dam breach could include flooding of low-lying areas downstream of the dam, including inhabited areas in Happy Valley-Goose Bay and Mud Lake, loss of life and injury, loss of homes and infrastructure, flooding of portions of the Trans Labrador Highway, erosion and transport of material downstream, disruption of aquatic habitat, etc. Failure of the Gull Island dam could result in failure of the Muskrat Falls dam (cascade failure). Nalcor also acknowledged that a failure of the Smallwood Reservoir dykes or dams could have a cascade effect on Gull Island and Muskrat Falls.

Nalcor predicted that a dam failure would have an adverse, moderate environmental effect on terrestrial fauna. All terrestrial key indicators would be affected though populations would persist. Nalcor predicted that residual biophysical environmental effects of the worst case dam failure would not be significant, however, residual socio-economic effects would be significant.

A Dam Break Study prepared by Hatch Consultants for Nalcor in April, 2008 assessed the consequences of dam failure for loss of life and economic, environmental and cultural losses. A number of scenarios were considered, including the "worst case scenario" of a cascade failure starting with the Gull Island dam leading to failure of the Muskrat Falls dam as well. In this scenario, it was estimated that there would likely be no loss of life with two or more hours of warning time.

Nalcor noted that both dams would be designed and operated in accordance with the Dam Safety Guidelines of the Canadian Dam Association. Under these Guidelines, Gull Island and Muskrat Falls would be classified as extreme, requiring the most rigorous of dam designs and

construction to withstand extreme weather events. Also in accordance with the Guidelines, an Emergency Preparedness Plan would be prepared. Nalcor noted that it considered the likelihood of a catastrophic dam failure at either site to be extremely low.

In response to information requests from the Panel, Nalcor provided additional information, including maps of areas that would be flooded following dam failure, its proposed mitigation measures to reduce the effects of a dam failure on the communities of Happy Valley-Goose Bay and Mud Lake and information on the Emergency Preparedness Plan, emergency response procedures and community evacuation procedures related to a dam failure and subsequent flooding. Nalcor also provided an assessment of the effects of a breach in the dams or dykes of the Smallwood Reservoir, noting that warning times for these failures would range from 5 hours to 12 days. The study noted that loss of life, assuming that emergency response and evacuation plans were in place, would be zero for any scenario where warning times were greater than two hours.

Economic losses were noted as including approximately \$235 million for properties affected in Happy Valley-Goose Bay and Mud Lake, including \$13-38 million for residential properties and \$6.3 billion for the proponent's own infrastructure, that is, the dams at Gull Island and Muskrat Falls and associated transmission lines. Nalcor asserted that this was a conservative estimate.

Nalcor's overall emergency response structure will consist of an Emergency Preparedness Plan identifying the hazards posed by the dam, the roles and responsibilities of all parties and the notifications to be made in the event of an emergency, its own Emergency Response Plan, the plans of responding public authorities and a maintenance, testing and training program to integrate and update processes.

Nalcor has committed to incorporate the results of its dam break modelling into its Emergency Response Plan for the Project and to work with each community identified in the Dam Break Study to develop evacuation strategies in the event of a dam failure. Nalcor has committed to have these community plans in place prior to inundation and to work with the communities and emergency service providers (municipalities, Fire and Emergency Services, Royal Canadian Mounted Police, etc) and assist as appropriate. Nalcor noted that by law, it has no authority to evacuate communities or implement emergency response plans for communities. Nalcor's commitment was to work with responsible authorities and provide assistance.

Nalcor documented that the area was relatively inactive seismically and field studies and site investigations were not necessary to ensure that the dams would not fail during a seismic event. Nalcor identified seismographic monitoring in the project area that would occur prior to construction as recommended in the seismicity study.

Nalcor stated that effects identified by Natural Resources Canada related to malfunctions potentially caused by seismicity would be addressed during engineering and design and assured the Panel that these effects would be looked at in great detail during the detailed design phase. According to Nalcor, effects identified were required to be considered for facilities constructed in accordance with applicable codes and standards and the Canadian Dam Association Guidelines.

Further information provided by Nalcor relative to the change in sequencing of the Project indicated that this change would not result in any change to the previously described effects of a dam failure or the effects of any of the other considered potential accidents and malfunctions.

Proposed Mitigation Measures and Monitoring

Nalcor's proposed mitigation measures and monitoring related to accidents and malfunctions included:

- use only those technologies that have a proven record of performance. Incorporate fail-safe design into Project planning;
- identify ways to prevent each potential accident or malfunction and reduce any effects if they do occur;
- address in the construction Environmental Protection Plan procedures for handling domestic garbage, sewage, wastewater and construction waste;
- establish the procedures to be followed in the event of a spill of hazardous material such as hydrocarbon products, battery acid or alkaline fluids;
- prepare Safety, Health and Environmental Emergency Response Plans, including identifying responsibilities and reporting protocols in the event of an incident;
- Incorporate a plan for preventing and combating forest fires into the Emergency Preparedness Plan;
- incorporate worst case scenarios into emergency response planning, to be completed prior to reservoir impoundment;
- work with each community identified in the Dam Break Study to develop evacuation strategies in the event of a dam failure, to be completed prior to inundation;
- work with emergency response providers and assist as appropriate in the event of an evacuation;
- implement a flood warning system for Mud Lake and Happy Valley/Goose Bay to be approved by the provincial Department of Environment and Conservation; and
- undertake additional field work to support the conclusions reached on geotectonic activity and seismic activity, as recommended by Natural Resources Canada, including examination of faults and prehistoric landslides plus seismograph monitoring for reservoir triggered seismicity, prior to construction.

14.2 PARTICIPANTS' VIEWS

Participants' concerns focused almost exclusively on the possibility of a dam failure. Participants indicated that while such an event might be a low risk, they were concerned about the possibility, how much warning they might have, and methods for informing them of a dam failure in time to reach a safe area. In general, participants wanted to be informed about what might happen if there was a Project-related flood and mechanisms to ensure their safety.

The major concern, expressed by Grand RiverKeeper Labrador Inc. among others, was the lack of a detailed evacuation plan in the event a dam failure occurred and flooding was imminent. Grand RiverKeeper asserted that emergency planning should be in place and approved by the community prior to Project approval. Related concerns were expressed by Mud Lake residents around the evacuation of the community of Mud Lake, for which evacuation options would be limited, assertions that Nalcor was not taking responsibility for emergency and evacuation planning and questions around the issue of compensation should a flooding event occur.

The Town of Happy Valley-Goose Bay informed the Panel that in consultation with Nalcor, an evacuation plan was in preparation, and raised the issue of whether an additional evacuation route would be required. In this regard, Town representatives also noted the municipality's lack of resources to respond to the issues resulting from the Project and the need for assistance

from Nalcor. The Town of North West River pointed out to the Panel that one outcome of a dam failure resulting in flooding in Happy Valley-Goose Bay, would be increased demands for services in North West River as the services of that Town would be called upon to assist residents of Happy Valley-Goose Bay.

Participants also raised questions about the level of detail in the maps provided by Nalcor showing the areas in and around Happy Valley-Goose Bay and Mud Lake that would be flooded in the event of a dam failure. Participants asserted that the maps were not helpful in providing residents with information about how flooding might affect them. Some participants also expressed dissatisfaction with the information provided by Nalcor respecting the economic losses that could result from a dam failure and subsequent flooding. Some Mud Lake residents also noted that it was impossible to obtain insurance for a flood as a result of a dam failure. Community members pointed out that Mud Lake would be put at increased risk by the Project and no mitigation is possible.

Some participants expressed concerns regarding the possibility of earthquakes. Grand RiverKeeper Labrador Inc. cited faults that existed on the north and south banks of the Churchill River near Gull Island and stated that filling the reservoirs could result in reservoir induced seismic activity. A participant expressed concern regarding dam failure should an earthquake occur. She noted that there had been historic seismic activity in the area of the Ste-Marguerite Hydro Project in Quebec, and although the dam did not sustain damages, she remained concerned.

Natural Resources Canada noted that the largest recorded earthquake in the Canadian Shield registered 4.1 on the Richter scale. The earthquake was felt on the ground but no damage occurred. The Department's view was that it did not expect large earthquakes in the reservoirs, but if earthquakes did occur, they would be of short duration and would not affect the dam structures. The Department did recommend however, that Nalcor confirm that other project structures in the vicinity of the dams would also not be affected and conduct additional field work on seismic activity and on past landslides in the area. This recommendation originated in part, from Natural Resources Canada's concern with the possibility of reservoir induced seismicity or seismic events which might be caused by filling the reservoirs.

The primary regulator for dam safety issues, the provincial Department of Environment and Conservation, noted that the dams would be designed to the highest industry standards (Canadian Dam Association Guidelines) with a low risk of dam failure. The regulator also noted that it agreed with the predicted environmental effects identified by Nalcor and concurred with the proposed mitigation measures to reduce or eliminate any adverse effects. The regulator also informed the Panel of the requirements to be fulfilled by Nalcor, including emergency response plans, emergency preparedness plans, periodic (every five years) dam safety reviews and provision of training and resources to implement the various plans. Such requirements are based in the provincial *Water Resources Act*.

14.3 PANEL CONCLUSIONS AND RECOMMENDATIONS

In reaching its conclusions with respect to the effects of accidents and malfunctions, the Panel considered the following factors to be particularly relevant:

- assurances from Nalcor that the dams at Muskrat Falls and Gull Island would be built and operated to the most rigorous standards as established by the Canadian Dam Association;
- concerns expressed by participants that notwithstanding construction and operation standards, the possibility exists that in the event the Project proceeds, a dam failure could

- have serious implications for the communities of Happy Valley-Goose Bay and Mud Lake, and lesser implications for Sheshatshiu and North West River;
- the fact that emergency preparedness and emergency response plans, including detailed plans for evacuation of potentially affected communities in the event of flooding, had not yet been prepared;
 - the possibility, however remote, that reservoir impoundment could result in reservoir induced seismicity, in turn resulting in damage to the dams and subsequent flooding;
 - the potential for accidental spills or unplanned discharges of wastewater and hazardous materials during the construction phase of the Project; and
 - the potential for forest fires caused by Project activity.

Construction Camp Sewage, Waste Water, and Hazardous Materials Spills

In its Environmental Protection Plan, Nalcor would address the disposal of domestic garbage, treated sewage at the large construction camps, including the proper disposal of wastewater and construction waste. The Plan would also address a comprehensive Safety, Health and Environmental Emergency Response Plan where responsibilities, effective response and incident reporting would be put in place in the event of an accident.

As a consequence, handling waste from the large construction camps and smaller sites, dealing with the risk and eventuality of hazardous materials, have all been carefully considered by Nalcor. The Panel concludes that Nalcor's handling of the risk of spills of hazardous materials, as well as the prevention and response to forest fires in the proximity of the Project, indicate a satisfactory degree of due diligence.

Forest Fires

Nalcor's Emergency Preparedness Plan would contain details to combat forest fires. Given the close proximity of the proposed Muskrat Falls dam and reservoir to Mud Lake and Happy Valley-Goose Bay as well as the forest cover in the vicinity and that Nalcor's studies indicate a fire could spread to a maximum distance of 10 kilometres from the fire source, the Panel concludes that such a Plan is necessary.

The Panel concludes that in light of Nalcor's commitments, the environmental effects of the Project from forest fires and spills of hazardous materials are not likely to be significant.

Dam Failure

The Panel noted that people in the communities of the Upper Lake Melville region expressed understandable concern about the impacts of a catastrophic and cascading dam failure. Despite assurances from Nalcor that the dams would be designed, built and operated to the most rigorous standards, community members sought more detail about emergency plans, and assurances from Nalcor that its mitigation measures would be open to public scrutiny.

In particular, the Panel was not convinced that two hours warning of flooding resulting from dam failure would in all circumstances be adequate to ensure no loss of life, especially in difficult circumstances (for example, during the hours of darkness, in poor weather). This places even greater importance on the need for thorough emergency planning, adapted to each community and a wide range of scenarios.

RECOMMENDATION 14.1 Emergency preparation for the possibility of a dam failure

The Panel recommends that, if the Project is approved, Nalcor be required to:

- prepare and provide to affected communities updated maps that more clearly show areas that would be flooded following a dam failure;
- prepare, in consultation with the relevant communities and appropriate authorities, an Emergency Preparedness Plan, for response in the event of catastrophic dam failure, and emergency response procedures and community evacuation procedures related to a dam failure and subsequent flooding; the Plan should be reviewed every five years;
- work with each community that has been identified as being at risk of flooding in the event of a dam failure to develop evacuation plans, to be completed prior to filling of the reservoirs;
- work with emergency response providers and assist as appropriate in the event of an evacuation;
- implement a flood warning system for Mud Lake and Happy Valley-Goose Bay to be approved by the provincial Department of Environment and Conservation; and
- conduct seismographic monitoring in the Project area prior to construction.

The Panel concludes that dam failure would result in a significant adverse environmental effect. While such a failure is very unlikely to occur, Nalcor must take responsibility to ensure communities are prepared for the worst case scenario and must also assume liability in the event that loss of life or damages were to occur.

RECOMMENDATION 14.2 Compensation for losses in the event of a dam failure

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador require Nalcor to assume liability on a 'no fault' basis for any loss of life and financial losses incurred because of the destruction of property and belongings and disruption of activities caused by flooding as a result of one or more dams failing on the lower Churchill River. Nalcor should provide guarantees in the form of insurance, bonds or other appropriate measures that individuals, businesses and institutions suffering damage would receive full compensation, the amount to be determined by a neutral third party, regardless of the cause of the dam failure.

Seismic testing

The Panel notes that the potential for seismic events related to dam construction and reservoir filling will be the focus of intensive study in engineering and design. The Panel is satisfied that Nalcor's obligation to meet applicable codes and standards of the Canadian Dam Association and the oversight of Natural Resources Canada are sufficient to ensure the dam would not fail during a seismic event.

Nalcor has also committed to conduct seismographic monitoring in the Project area prior to construction. However, Natural Resources Canada noted the desirability of conducting such monitoring during infilling of the reservoir. This would allow Nalcor to slow the rate of infilling to mitigate any seismic activity that might occur.

RECOMMENDATION 14.3 Seismic testing

The Panel recommends that, if the Project is approved, Nalcor carry out seismic testing during reservoir filling and apply appropriate mitigation measures in the event of a seismic event related to reservoir filling.

15 ENVIRONMENTAL MANAGEMENT

Environmental management consists of the following:

- measures to mitigate adverse Project effects;
- measures to enhance beneficial effects;
- monitoring of Project effects and regulatory compliance (including pre-construction baseline monitoring needed to enable Project effects monitoring);
- follow-up programs to verify the accuracy of predictions and effectiveness of mitigation measures; and
- adaptive management measures to mitigate and monitor unanticipated impacts.

This section of the report deals with those aspects of environmental management that would be of general application to the Project, including decommissioning. Other sections cover the environmental management measures that would apply to specific Project effects.

15.1 ENVIRONMENTAL MANAGEMENT DURING THE LIFE OF THE PROJECT

15.1.1 Nalcor's Views

Nalcor has committed to an Environmental Management System for the Project that would integrate environmental management into planning and daily operations, including:

- risk identification;
- employee awareness and community consultation;
- plan development and implementation; and
- monitoring of environmental compliance and the effectiveness of environmental protection measures.

Nalcor stated that it had not yet developed a budget for environmental management; however, a comprehensive budget would need to be in place for Project sanction.

Nalcor stated that it would prepare Environmental Protection Plans that would specify environmental management measures and emergency preparedness procedures for Project construction and operation and maintenance personnel. Such plans would include:

- standard measures for sites such as roads, camps, dams and structures, de-watering operations, forestry operations, and transmission lines; and
- non-standard measures for activities such as reservoir preparation, rehabilitation of riparian habitat, inundation, and fish habitat compensation.

Environmental Protection Plans would be developed for approval by regulators prior to the start of construction and environmental monitors would be deployed in the field to ensure adherence to these plans.

Nalcor has committed to extensive monitoring and follow-up throughout the life of the Project. Proposed programs have been described at an overview level in the EIS and, to the extent that specific mitigation and monitoring commitments have been made to date, they are listed in the relevant chapters of this report. Additional information would be required including more detailed baseline studies in some cases. The details of monitoring and follow-up programs would be

developed in cooperation with the various regulators prior to construction. Such programs would incorporate the results of the environmental assessment process and would be consistent with Panel recommendations. Nalcor has committed to the preparation of annual reports showing the results of all of the various monitoring and follow-up programs including dissemination on a Project website.

Nalcor has committed to implement adaptive management measures to refine and optimize relevant mitigation, monitoring and follow-up in the event that Project effects were not as predicted or mitigations were ineffective. Nalcor stated that a degree of uncertainty is inherent in environmental assessments so, monitoring, follow-up and adaptive management would be important tools to verify effects predictions and management. Consistent with the guidance provided by the Canadian Environmental Assessment Agency, Nalcor would address adaptive management using the following systematic approach:

- identify potential Project effects on a valued ecosystem component or key indicator;
- develop management goals for that effect;
- design a monitoring and follow-up program to track Project effects and the accuracy of predictions;
- implement the monitoring and follow-up program;
- analyze the monitoring and follow-up results and communicate with regulators;
- evaluate the attainment of goals;
- adapt the monitoring and follow-up program, if required, to better achieve goals; and
- continue to conduct monitoring, follow-up and adaptation as necessary until goals are achieved.

Nalcor has proposed the formation of a Monitoring and Follow-up Committee comprised of representatives of Aboriginal groups, communities, impartial scientific experts, and federal and provincial regulators. The role of such a Committee would be to:

- facilitate communication of monitoring and follow-up objectives;
- define monitoring and follow-up requirements;
- consider proposals to meet those requirements;
- review and advise on results; and
- provide feedback to Nalcor.

All activities, advice and recommendations of the Committee would be made available to the public.

Nalcor stated that the Government of Newfoundland and Labrador may issue a regulation or order that would legislatively mandate Nalcor to adhere to certain conditions to the Project, including requirements for environmental management programs and involvement of relevant stakeholders.

Nalcor proposed the following mitigation measures and monitoring related to environmental management (of general application to the Project):

- implement Nalcor's environmental policy through its Environmental Management System that meets the ISO 14001 standard;
- implement Environmental Protection Plans for Project construction and operation for field implementation of all committed environmental protection measures including standard

mitigation measures and non-standard measures, including those for reservoir preparation, rehabilitation of riparian habitat, inundation, and fish habitat compensation;

- carry out a systematic adaptive management process that is consistent with the Canadian Environmental Assessment Agency's guidelines;
- address the remaining uncertainties in Nalcor's effects conclusions through detailed monitoring, follow-up programs, and adaptive management, requiring further regulatory approval and ongoing stakeholder consultation;
- include in follow-up monitoring reports, the raw data on which the reports are based, as recommended by Environment Canada;
- develop the details of monitoring and follow-up programs prior to construction in consultation with the various regulators and make all monitoring results publicly available; and
- form a Monitoring and Follow-up Committee comprised of representatives of Aboriginal groups, communities, impartial scientific experts, and representatives of federal and provincial regulators to advise on monitoring and follow-up programs.

15.1.2 Participants' Views

Comments by participants on Nalcor's overall approach to environmental management are included in this section. Comments on specific environmental management programs are included in other sections of the report.

Federal and provincial government departments generally supported Nalcor's environmental management proposals. They expect that Nalcor would comply with regulatory and non-regulatory requirements and commitments. Departments expected that sufficient resources would be made available under the annual budgeting process for them to carry out their mandated responsibilities.

Fisheries and Oceans Canada stated that federal responsible authorities for the Project (Fisheries and Oceans Canada and Transport Canada) might include recommendations for mitigation, monitoring and follow-up from other departments, such as Environment Canada, in the terms and conditions of any approvals that they issue for the Project.

Fisheries and Oceans Canada would set conditions for mitigation, follow-up and monitoring in its Project authorizations and would make periodic field checks over multiple years to verify the work, for which it has sufficient resources at present.

Innu Nation stated the following concerns relating to Nalcor's proposed environmental management approach:

- Costs were not given and Innu Nation doubted the Project's ability to pay for planned and unplanned mitigation and monitoring.
- There was no indication as to how holders of Aboriginal traditional and community knowledge would be involved.
- Information specific to each monitoring and follow-up program was not provided so the scope of work and costs could not be understood.
- Firm commitments were lacking by government departments responsible for certain aspects of monitoring and effects management.
- A detailed table of commitments would be needed stating which are covered by regulating instruments and which are not.
- The objective of rehabilitation programs must be to re-establish conditions suitable for sustainable use by Aboriginal people.

Innu Nation stated that Nalcor's proposed socio-economic effects monitoring and follow-up program would be inadequate for reasons including:

- It depends on other agencies with Nalcor merely providing information to them.
- It makes unsubstantiated assumptions such as the prediction of limited in-migration.
- It offers no funding support to local communities.
- It fails to involve Innu communities in the process.
- There is inadequate baseline socio-economic data about Innu communities upon which to measure Project effects.

The NunatuKavut Community Council and Naskapi Nation of the Kawawachikamach requested more specific information on how Aboriginal people would be involved in the monitoring process. They also requested that impacts of the Project be mitigated to the fullest extent possible and that monitoring be done to measure effectiveness and identify follow-up needs.

Other participants stated concerns and recommendations relating to Nalcor's proposed environmental management approach including the following:

- Nalcor provided insufficient detail on monitoring and follow-up programs and Environmental Protection Plans and Emergency Preparedness Plans.
- A fully-funded independent environmental management oversight body should be established for construction and operation, including independent environmental monitors.
- Firm commitments should be required for every program whether implemented by Nalcor or another party.

15.1.3 Panel Conclusions and Recommendations

In reaching its conclusions on environmental management, the Panel considered the following factors to be particularly relevant:

- need for Aboriginal and other stakeholder involvement in environmental management;
- need for independent oversight of environmental mitigations, monitoring and adaptive management response;
- importance of a long-term financial commitment to support environmental management requirements;
- need for clarity regarding the respective responsibilities of Nalcor and individual provincial and federal government departments for all aspects of environmental management;
- coordination of the roles of various government departments with regulatory authority and/or expertise to ensure compliance;
- need for an authorizing regulation by the provincial government mandating that all required environmental management be carried out by Nalcor and responsible departments;
- need for environmental management oversight and community liaison;
- role of adaptive management as Project effects become apparent over time and mitigation and monitoring programs need adjustment;
- role of monitoring in making a contribution to the growth in knowledge about the Churchill River ecosystem; and
- environmental management implications of separate sanction decisions.

Environmental Management Requirements

The Panel recognizes that there are extensive biophysical and socio-economic Project-related effects and considerable uncertainty that would require monitoring and mitigation during construction and operation of the Project. Nalcor has committed to a broad range of environmental management measures and the Panel has recommended additional measures. Some but not all of this would be covered under the regulatory authority of the various provincial and federal government departments. While there is sufficient information about some components of the environmental management plan, there are other aspects of mitigation, monitoring and adaptive management for which details are not yet available.

It is the view of the Panel that due to the long-term nature and complexity of the environmental management requirements for the Project, a mechanism is required to ensure compliance until there would no longer be a risk of adverse effects as a result of the Project. It is expected that this would be at least thirty years from the impoundment of the second reservoir.

RECOMMENDATION 15.1 Authorizing regulation

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador issue an authorizing regulation or equivalent mechanism that:

- lists and requires Nalcor to implement all its environmental management commitments in relation to the Project made during the course of the environmental assessment, plus the additional measures recommended by the Panel and accepted by the Government of Newfoundland and Labrador;
- lists and requires provincial departments to implement all their environmental management commitments in relation to the Project made during the course of the environmental assessment, plus the additional measures recommended by the Panel and accepted by the Government of Newfoundland and Labrador;
- includes a mechanism for updates as required to reflect any additions or changes, including adaptive management strategies that may be required and are not yet identified;
- ensures compliance with Environmental Protection Plans, Emergency Response Plans, Contingency Plans, Occupational Health and Safety Plans, and Environmental Effects Monitoring Plans including those that are implemented through another regulatory instrument and those that are unregulated;
- requires Nalcor to prepare and publish on the internet an annual report describing its environmental management activities and results, including mitigation, monitoring and adaptive management as appropriate, and related disbursements;
- establishes a monitoring and community liaison committee; and
- remains in effect for the duration of the construction period and a sufficient period of time thereafter to ensure there is no longer a risk of adverse effects as a result of the Project.

Federal Provincial Regulatory Coordination

The Panel recognizes the need for coordination between provincial and federal regulatory agencies to ensure compliance with the requirements of all relevant federal and provincial regulations, including the Authorizing Regulation.

RECOMMENDATION 15.2 Federal-provincial joint regulatory plan

The Panel recommends that, if the Project is approved, the federal and provincial governments prepare a joint regulatory plan for the Project which outlines their respective regulatory requirements and includes a coordinated approach to areas where there is overlapping or related jurisdiction, and commit to it by signing a Memorandum of Agreement. The regulatory plan should address the regulations, guidelines, standards and criteria to be applied to activities. Each government would appoint a coordinating department or agency to prepare the plan and to produce a joint annual report regarding Nalcor's compliance, any issues or problems that were identified and how they were resolved. This report would be made available to the public through the internet.

Financial Support for Environmental Management

The Panel acknowledges that the habitat compensation, environmental monitoring, mitigation and adaptive management measures proposed by Nalcor and the Panel for the Project are extensive. Detailed environmental management budgets have not yet been prepared so there is uncertainty regarding the level of financial commitment required to support this aspect of the Project. The Panel also notes that the time frame for the collection of baseline and follow-up data that is required for construction of habitat compensation, environmental monitoring, mitigation and adaptive management, could extend from the present to twenty or more years in the future. The Panel concludes that long-term financial commitments would be required to ensure sufficient resources are available to further refine and implement the environmental management programs. Given the difficulty in forecasting expenditures in the long term, the Panel suggests that Nalcor and relevant government departments make general commitments with a ten-year forecast, to be updated every five years.

RECOMMENDATION 15.3 Long-term funding for environmental management from Nalcor

The Panel recommends that, if the Project is approved, and to the extent that funds are not committed from other sources, Nalcor identify and allocate in its detailed Project budget, financial support for environmental management for the duration of Project construction. The Panel further recommends that Nalcor make a general commitment with a ten-year forecast, to be updated every five years, until such time as there is no longer evidence of ongoing environmental effects resulting from the Project.

RECOMMENDATION 15.4 Long-term funding for environmental management from government departments

The Panel recommends that, if the Project is approved, the governments of Newfoundland and Labrador and Canada make long-term commitments to support annual budget requests by the relevant departments with responsibilities for project-related environmental management including socio-economic mitigation commitments. The Panel further recommends that the governments make general commitments with a ten-year forecast, to be updated every five years, until such time as there is no longer evidence of ongoing environmental effects resulting from the Project.

Monitoring and Community Liaison

In a Project of this scale with a broad range of proposed mitigation measures, monitoring programs and concerns expressed by the public, ongoing review of the environmental management activities would be important to ensure compliance with regulatory requirements and to assure the general public that the Project is proceeding within its approved guidelines. The Panel proposes that the provincial Department of the Environment and Conservation

appoint a Monitoring and Community Liaison Committee, which would include representation from communities and community agencies, Aboriginal groups, provincial and federal government departments and ex-officio representation from Nalcor. The Panel notes that it would be important for the communities most affected by the Project to have a voice in the selection of Committee members to represent them and that this could be done through a nomination process.

The Committee would play an important role in ensuring a transparent approach to communicating the results of the monitoring programs to the public by various means including public forums, print and electronic media. It could also seek independent expert advice, if necessary to address public concerns.

Given the diversity of biophysical, employment, business, social and health effects to monitor, it is expected that subcommittees would be formed to address the various areas. The Panel anticipates that biophysical and economy and business monitoring programs would be established by Nalcor at the detailed Project planning stage and that the results of the social effects needs assessment and research described in Chapter 13 would inform the ongoing monitoring of social effects which would be reviewed by this Committee. If human mercury level monitoring is required, the details would be developed by Nalcor in collaboration with Health Canada and the provincial Department of Health and Community Services as outlined in Chapter 13 and overseen by this Committee.

RECOMMENDATION 15.5 Lower Churchill Project Monitoring and Community Liaison Committee

The Panel recommends that, if the Project is approved, prior to the start of construction, the provincial Department of Environment and Conservation appoint a Monitoring and Community Liaison Committee, using a community-based nomination process. Nalcor, through the Department, should provide the Committee with sufficient resources to allow for staff support, expenses and a modest honorarium for non-government participants, acquisition of independent expert advice, and adequate communication with community residents including occasional public forums. The mandate of the Committee would be set out in the Authorizing Regulation and the Federal-Provincial regulatory plan. The Committee would operate throughout the construction period and for the first ten years of the operating period, at which point the continuing need for the Committee should be reassessed by the Department in consultation with the Committee, the communities and Nalcor.

The Committee would:

- provide community feedback and advice to the Department and to Nalcor on relevant issues including Project-specific mitigation, impact monitoring and adaptive management committed to by Nalcor and as recommended by the Panel;
- be empowered as required to establish subcommittees or working groups to address the key areas of biophysical monitoring and follow-up, enhancing employment and business benefits, and health and social issues;
- have representation from communities, community-based agencies and non-government organizations, Aboriginal organizations, relevant federal and provincial government departments and Nalcor (ex-officio); and
- liaise with the public to ensure a transparent approach to addressing public concerns and the communication of monitoring results.

To ensure that the results of the monitoring programs for the Project would have public credibility and scientific relevance, the Panel suggests a systematic approach as outlined in Recommendation 15.6.

RECOMMENDATION 15.6 Project-specific effects monitoring programs

The Panel recommends that, if the Project is approved, all Project-specific effects monitoring programs, whether conducted by Nalcor, governments or in combination, include the following elements:

- identification of monitoring objectives and means of achieving verifiable results capable of guiding remedial action;
- formulation of clearly stated research questions capable of testing impact predictions;
- key measurable indicators linking Project activities to outcomes, and threshold or reference levels to identify Project effects;
- strategies and protocols for data collection and quality control;
- protocols for data compilation, storage, control and access;
- provision for data analysis and assessment; and
- reporting procedures and schedules.

Adaptive Management

The Panel recognizes that at this stage of Project planning, detailed adaptive management strategies have not yet been developed for all components of the environmental management program. In some instances, Nalcor has indicated that provincial government departments would be responsible for adaptive management, for example in the management of adverse socio-economic impacts. There has been no binding commitment from the relevant provincial government departments that the necessary resources would be made available for this. The Panel expects that this would be addressed through the Authorizing Regulation and funding recommendations it has proposed. In the absence of specific details on future adaptive management, the Panel makes the following recommendation regarding the general approach.

RECOMMENDATION 15.7 Adaptive management

The Panel recommends that, if the Project is approved, adaptive management for Project-specific or cumulative effects, whether conducted by Nalcor, governments, or in combination, include the following components:

- commitment to a proactive approach to adaptive management;
- clearly defined impacts thresholds to clarify where and when adaptive responses would be necessary;
- implementation and contingency plans and resources to enable responsive action especially in areas where effect predictions are thought to be uncertain and where predictive errors may have serious consequences;
- transparent process for setting and adjusting monitoring and management priorities; and
- provision for regular review of adaptive management effectiveness, adjustment of related monitoring and responses to focus on significant continuing concerns.

Concerns and Complaints Resolution

Given the scope of the Project and the wide range of issues raised by participants during the environmental assessment process, the Panel recognizes the importance of an avenue for individuals to resolve any complaints that may arise related to the Project and its effects. The Panel proposes that Nalcor develop a concerns and complaints resolution program as outlined in the recommendation below.

RECOMMENDATION 15.8 Complaints resolution

The Panel recommends that, if the Project is approved, before the start of construction, Nalcor develop a complaints resolution process, in consultation with the Monitoring and Community Liaison Committee, to address concerns relating to possible adverse Project effects on individuals, and to be implemented during construction and operations. The process could include the following:

- easy access for individuals to bring concerns or complaints to Nalcor via a toll-free phone number, website and other appropriate means;
- dedicated Nalcor staff support to receive, process and respond to complaints;
- a tracking process with response time targets;
- third-party adjudication in the event that complaints cannot be otherwise resolved to the satisfaction of both Nalcor and the complainant; and
- a system to report on complaints received and how they were resolved.

Implications of Separate Sanction Decisions

Depending on the gap between the development of Muskrat Falls and Gull Island, the Panel notes that there is the potential to apply new information, technology and lessons learned from the construction and environmental management of the first development to the second. This applies for example to the reservoir clearing process and advancements that may occur in harvesting techniques, wood markets and the understanding of mercury mobilization but it could also apply to a broad range of biophysical and socio-economic effects.

The Panel notes that Nalcor is seeking release from Environmental Assessment that would include both Muskrat Falls and Gull Island. Given the uncertainty associated with the timing of the second sanction decision, it is possible that a considerable time period could elapse after the environmental release, and before construction of the second generating facility and reservoir. It is not possible to predict what changes may have taken place with respect to the biophysical or socio-economic environments or what new knowledge or technology could be applied at that time.

It would be important that, prior to the second sanction decision, Nalcor, the Monitoring and Community Liaison Committee and the relevant federal and provincial government agencies conduct a careful review of the outcomes of the environmental management of the first and any new information that is available to identify opportunities to improve with the second development. For this reason, the Panel is recommending a time limit for the environmental release that would apply to the second sanction decision and that the time limit be based on an overlapping construction scenario, which the Proponent has indicated is the preferred approach.

RECOMMENDATION 15.9 Environmental review in the event that construction of the second generating facility is delayed

The Panel recommends that, if the Project is approved and the construction of the second generating facility and reservoir does not start before the first is completed, the

environmental release would expire and terms and conditions contained in the original release would be revisited. The extent of the review required for later release would be the decision of the relevant federal and provincial governments, depending on applicable laws and circumstances at the time.

Benefits of Environmental Management

The information gathered as a result of the environmental management program would contribute to the growth in knowledge about the Churchill River ecosystem. Little was known about this ecosystem prior to the Churchill Falls development. The background studies conducted in preparation for this Project and the proposed monitoring and follow-up work have the potential to improve the understanding of the Project environment. In the case of the aquatic environment for example, the ongoing work studying fish in the lower Churchill River and the proposed nutrient and mercury monitoring in the Goose Bay estuary and Lake Melville, would expand the limited existing baseline knowledge substantially. Proposed monitoring of terrestrial key indicators and land and resource use, socio-economic effects research and the ongoing work on cultural heritage resources would also contribute to the knowledge base, as would local hiring for environmental management positions, where possible.

RECOMMENDATION 15.10 Local hiring for environmental management work

The Panel recommends that, if the Project is approved, where possible, Nalcor hire local people to work on environmental monitoring and mitigation projects to benefit from their local knowledge and to develop local skills and experience in the field of environmental management.

The Panel observes that one of the most valuable and valued attributes of the panel review process is its inclusion and transparency. The Panel therefore encourages both governments to continue this transparency in its decision making by making the government responses to the Panel report publicly available.

RECOMMENDATION 15.11 Government response to Panel report

The Panel recommends that the federal and provincial governments provide written responses to the Panel report and that these responses be made available to the general public through the internet.

15.2 DECOMMISSIONING

15.2.1 Nalcor's Views

Nalcor stated that it had no plans to decommission the Project and no funds would be allocated for this. The Project would be expected to operate for at least 75 years and potentially much longer. Nalcor anticipated that each generating plant would be refurbished at the end of its normal operating life and would then continue in operation.

Nalcor stated that it would be impossible to predict if and when decommissioning of the Project would be required and what the costs associated with decommissioning would be at that time. It estimated that the net present value of such costs would be a small amount. Nalcor stated that decommissioning would require an environmental assessment and compliance with regulatory requirements at the time. This approach to decommissioning for large-scale hydroelectric projects was approved by the Joint Review Panel for the Romaine River Project and Nalcor submitted that it would be appropriate for this Project as well.

If decommissioning were required, options would be:

- complete removal of Project infrastructure and return to pre-Project conditions as far as practical;
- partial removal of Project infrastructure and return of the river to pre-Project water levels; and
- conversion to self-regulating and non-power-producing with reservoirs and dams remaining in perpetuity.

Environmental management for decommissioning would have to take into account the socio-economic effects of loss of reservoir usage and the biophysical effects of dam removal, such as the effects of siltation on fish habitat, sediment removal, bank stabilization and re-vegetation. Dam removal and changing of the reservoirs back to a river would cause rapid release of sediments into the water as the river and tributaries created new channels. Possible mitigation techniques would include slow or staged drawdown, seeding and re-vegetation of banks, sediment traps, dredging, leaving part of a dam in place to retain sediments, and allowing sediments to flush downstream. Nalcor predicted that it would take years for the river to reach dynamic equilibrium depending on the rates of bank stabilization, re-vegetation and sedimentation of the river. The sequence and timing of riparian wetland and aquatic habitat formation and associated wildlife recovery would vary with the nature of the river and the impacts of flooding and ice scour events.

Nalcor's proposed mitigation measures and monitoring related to decommissioning included the following:

- Plan to refurbish each generating plant at the end of its normal operating life so it can continue in operation.

15.2.2 Participants' Views

Sierra Club Atlantic called on Nalcor to provide for future costs of \$4.4 to \$4.6 billion in Project cost estimates for eventual dam removal. It stated that decommissioning by conversion to a self-regulating facility would pose an unacceptable risk of eventual dam failure. Similarly, Grand RiverKeeper Labrador Inc. called on Nalcor to prepare for eventual decommissioning and dam removal by providing a bond of \$5.4 to \$8.1 billion.

15.2.3 Panel Conclusions and Recommendations

In reaching its conclusions on decommissioning, the Panel considered the following factors to be particularly relevant:

- high cost of eventual decommissioning;
- uncertainty regarding when and whether or not it will be required; and
- range of options for decommissioning and associated environmental effects.

The Panel recognizes that decommissioning is very unlikely to happen in the near or medium term however, evidence of decommissioning experience elsewhere indicates that when it is required, the cost is very high. There is the potential that it could be a substantial burden on future ratepayers or taxpayers who were not involved in the decision to undertake the Project. The Panel concludes that Nalcor needs to take responsibility for the possibility that the Project would eventually need to be decommissioned. This can be done in a number of ways, including insurance, the posting of a bond or the establishment of a dedicated fund. Given that the need

for decommissioning in the near future would be very unlikely, the Panel notes that the financial mechanism need not be implemented immediately, but it should be in place after the Project debt has been retired.

RECOMMENDATION 15.12 Decommissioning

The Panel recommends that Nalcor demonstrate, prior to Project approval and in a manner acceptable to both governments, how it will assume financial responsibility for the potential future decommissioning of the Project to ensure that decommissioning does not become a burden to future generations.

16 CUMULATIVE EFFECTS

This chapter reviews Nalcor's approach to assessing the cumulative effects of the Project and the overall findings. Other chapters cover cumulative effects on specific valued ecosystem components and key indicators of the biophysical and socio-economic environments. Cumulative effects are defined in the EIS Guidelines as changes to the environment due to the Project where those overlap, combine or interact with the environmental effects of other existing, past or reasonably foreseeable projects or activities.

16.1 NALCOR'S VIEWS

Nalcor carried out an assessment of the cumulative environmental effects of the Project as required in the EIS Guidelines. In its cumulative effects assessment, Nalcor employed a screening process that considered all relevant past, present and reasonably foreseeable projects and activities where biophysical and socio-economic effects could potentially overlap, both temporally and spatially, with effects of the Lower Churchill Project. The following projects and activities were identified and assessed:

- Voisey's Bay project;
- Labrador West mining;
- additional transmission lines (including transmission lines to the Island);
- upgrades to the Trans Labrador Highway;
- commercial forestry;
- cultural and recreational land use;
- infrastructure projects and economic development in Upper Lake Melville (including 5 Wing Goose Bay Military Base remediation project); and
- military training (North Atlantic Treaty Organization Special Forces Training).

A number of projects and activities were considered but not assessed because they either took place in the past and effects were determined to be reflected in baseline conditions (such as the Churchill Falls development), or they were not reasonably foreseeable (such as mining of mineral sands, aluminum smelter and uranium mining). Nalcor gave the following reasons for excluding the latter group of projects from its cumulative effects assessment:

- mineral sands mining is hypothetical and regulatory authorities would address any requirements for environmental management;
- aluminum smelter is hypothetical and environmental assessment planning and regulatory authorities would ensure that adverse effects would be minimized; and
- uranium mining would be physically removed from the Project, without the possibility of overlapping biophysical effects, and relevant planning and regulatory authorities would ensure proper planning and management for infrastructure, social services, fish and wildlife.

In response to concerns from participants regarding the remediation of contamination at 5 Wing Goose Bay Military Base, Nalcor stated that this project had undergone an environmental assessment which concluded that there would be no work undertaken in the Churchill River and no risk of contaminants entering the river because groundwater flows are minimal. Nalcor predicted that there would be no interaction with the Lower Churchill Project.

Nalcor used the following approach for its cumulative effects assessment. The cumulative effects of past and present projects and activities were considered to be captured in the baseline conditions of the existing environment and hence, were incorporated in the assessment of Project effects and mitigation measures. Temporal boundaries did not track environmental changes over time because again, past effects were considered to be captured in baseline conditions. For reasonably foreseeable future projects or activities, Nalcor relied on experience and expert opinion for a largely qualitative assessment of cumulative effects. Spatial boundaries for the assessment of cumulative effects were generally the same as those used for Project effects. Nalcor did not address the potential for cumulative effects resulting from induced development. It stated that induced development could not be predicted with any certainty and that any new projects would be subject to government approval and environmental assessment, including assessment of cumulative effects.

Using this approach and the same significance criteria as for Project effects, Nalcor determined that cumulative effects for most valued ecosystem components and key indicators would be adverse but not significant, with the exception of the following:

- Red Wine Mountain Caribou – adverse and significant;
- aquatic environment – neutral; and
- economy and employment – positive and significant.

In response to participant concerns, Nalcor stated the following:

- the cumulative effects relating to all valued ecosystem components and key indicators of the biophysical and socio-economic environments were considered appropriately, in accordance with the EIS Guidelines;
- the spatial and temporal boundaries and baseline conditions used to predict Project effects were adequate for assessing cumulative effects; and
- its predictions of residual environmental Project and cumulative effects were precautionary, based on conservative assumptions, professional judgment, and effective proposals for mitigation, monitoring, follow-up and adaptive management.

16.2 PARTICIPANTS' VIEWS

Participants raised several issues pertaining to Nalcor's approach to cumulative effects assessment, including the following:

- spatial and temporal boundaries for the cumulative effects assessment were not sufficiently broad;
- the notion of reflecting past and present projects and activities in baseline conditions did not give an understanding of past changes, particularly changes to the lower Churchill River resulting from the Churchill Falls development; and
- environmental management measures undertaken for the Project would not respond to the cumulative effects of other projects and activities.

Participants commented that Nalcor's approach varied from the EIS Guidelines and from guidance provided in the *Practitioners Guide for Cumulative Effects Assessment* published by the Canadian Environmental Assessment Agency, which states the following:

- cumulative effects boundaries will generally be different from (larger than) the boundaries for the corresponding Project effects; and
- past actions often become part of the existing baseline conditions; however, it is important to ensure that the effects of these actions are recognized.

Participants noted potential interactions with the fuel remediation project and also expressed concerns regarding the exclusion of future projects, such as mineral sands mining, uranium mining, future hydroelectric development, aluminum smelter and other potential induced developments, from Nalcor's cumulative effects assessment.

In particular, participants had concerns about potential cumulative effects relating to many valued ecosystem components and key indicators of the biophysical and socio-economic environments covered in other chapters of the report, including the following:

- effects of climate change and reservoir creation on water temperature, fish growth and spawning (Chapter 6);
- downstream effects below Muskrat Falls, in Goose Bay and in Lake Melville (Chapter 6);
- riparian habitat loss as a result of the Churchill Falls and Lower Churchill projects (Chapter 7);
- effects of any increased stress on the Red Wine Mountain and George River caribou herds (Chapter 7);
- changes in Aboriginal and non-Aboriginal land and resource use and local perceptions about the safety of country food as a result of methylmercury contamination from the Churchill Falls and Lower Churchill projects (Chapters 6, 8, 9 and 13);
- changes in the timing of ice formation and break-up because of the combined effect of climate change and the Project (Chapter 8);
- effects on Aboriginal lifestyle of hydro-related flooding, transmission lines, increased regional access and the increased presence of other Aboriginal and non-Aboriginal land and resource users (Chapter 9); and
- socio-economic effects due to the Project, the Labrador-Island Transmission Link and various potential future development projects (housing shortage in Happy Valley-Goose Bay, labour shortage, loss of employees to construction jobs, effects of in-migration on families and community infrastructure and services) (Chapters 12 and 13).

16.3 PANEL CONCLUSIONS AND RECOMMENDATIONS

The Panel considered the cumulative effects assessment information submitted by Nalcor and participant concerns regarding its adequacy. Through information requests and the public hearing, the Panel sought further information regarding the effects of the Churchill Falls development, downstream effects, and justification for assessment boundaries and cumulative effects assessment methodology. At the end of this process, it is the view of the Panel that Nalcor's approach to cumulative effects was less than comprehensive and that participants raised valid concerns that contributed to a broader understanding of the potential cumulative effects of the Project.

Participant input regarding the residual effects of the Churchill Falls development highlighted the limitations of Nalcor's approach of including the effects of past projects in baseline conditions, without clearly acknowledging these effects. Generally, Nalcor's approach illustrates the limitation of project-specific cumulative effects assessment, namely that the end result is the potential for incremental decline in the biophysical and socio-economic environments with each successive development.

It is the view of the Panel that the cumulative effects assessment process for this Project is an example of the poor track record of project-based cumulative effects assessment. The Panel also recognizes that there are some inherent limitations to a project-based approach to cumulative effects assessment. These include the following:

- limited information about the effects of past projects, such as the Churchill Falls development, that occurred prior to the advent of environmental assessment; and
- the disincentive for proponents to identify adverse cumulative effects when they are perceived as a potential threat to Project approval.

Given that resource development is likely to continue in Labrador and that it is difficult to ensure that cumulative environmental effects will be recognized and addressed through individual project environmental assessments and management programs, the Panel believes that there is a role for government agencies to support regional processes to ensure a broader, more integrated approach to cumulative effects assessment. This could include the addition of cumulative effects considerations to the mandate of the Northern Strategic Plan or a Strategic Environmental Assessment of hydroelectric and other industry development.

RECOMMENDATION 16.1 Regionally integrated cumulative effects assessment

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation, in collaboration with the provincial Department of Labrador and Aboriginal Affairs and other relevant departments, identify regional mechanisms to assess and mitigate the cumulative effects of current and future development in Labrador.

Protected areas can play an important role in limiting the cumulative adverse environmental effects of development in Labrador over time. The Panel was informed that the process of establishing protected areas is underway by the Province. However, limited areas are currently under protection in Labrador. In light of recent and expected future development, adequate protection of wilderness areas should be made a priority. It is critical for the effectiveness of protected areas that their selection be based on ecological considerations rather than based on which areas have the least development potential.

RECOMMENDATION 16.2 Establishment of protected areas

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation commit resources to advance the Protected Areas Strategy process by working towards the following goals and reporting annually on progress:

- identify priority candidate areas for provincial protection in Labrador in order to bring the total protected area (federal and provincial) up to the national average (approximately 8.5 percent) before any additional major development is approved in Labrador;
- identify additional candidate areas in Labrador needed to bring the total protected area up to the level identified in the Protected Areas Strategy as desirable for adequate conservation purposes (10 to 15 percent);
- through this process, address preservation of representative areas of all ecozones, mitigation of habitat fragmentation, especially for migratory wildlife, and protection of selected rivers; and
- establish a schedule to ensure that priority candidate areas are protected.

17 PANEL'S CONCLUDING COMMENTS

17.1 INTRODUCTION

The Panel was appointed to meet the environmental assessment requirements of the Project under provincial and federal environmental assessment legislation. It is generally recognized that the purpose of environmental assessment is to ensure that projects contribute to sustainable development.

Under the *Canadian Environmental Assessment Act*, the goal of contributing to sustainable development is set out in the purposes of the Act. This goal is met in part through the requirement that a project that is likely to cause significant adverse environmental effects can only proceed if federal decision makers conclude that these effects are justified in the circumstances. Provincial decision makers have broader discretion to determine whether a project should proceed in light of the results of the environmental assessment process.

The Panel has:

1. determined that the Project would be likely to have significant adverse effects in the following areas:
 - fish habitat and fish assemblage;
 - terrestrial, wetland and riparian habitat;
 - the Red Wine Mountain caribou herd;
 - fishing and seal hunting in Lake Melville should consumption advisories be required;
 - culture and heritage (the "loss of the river").
2. identified a range of potential Project benefits; and
3. identified crucial additional information required before the Project should proceed in the areas of long-term financial returns, energy alternatives to serve Island needs and reducing uncertainty about downstream environmental effects.

For the Panel's approach to determining significant adverse effects, the reader is directed to Chapter 3.

Both federal and provincial decision makers will now need to determine whether the Project should proceed, in light of the significant adverse effects, risks and uncertainties identified in this report. The Panel report will inform the provincial decision under section 67 of the Newfoundland and Labrador *Environmental Protection Act* and the federal decision under section 37 of the *Canadian Environmental Assessment Act*. In both cases, the report of the Panel is the only source of information for decision makers identified in the legislation.

This chapter is intended to provide assistance to decision makers based on the Panel's lengthy and detailed involvement with the proposed Project over the past two and a half years, and invaluable experience in being able to engage in a dialogue with the Nalcor and a wide range of review participants during the hearing.

To address the complex task of providing advice as to whether and how the Project would contribute to sustainability, the Panel has been guided by the following principle

The effects, risks and uncertainties of the Project should be fairly distributed among affected communities, jurisdictions and generations, and the Project should result in net environmental, social and economic benefits.

The Panel's Terms of Reference mandate it to consider a broad range of social, cultural, economic and biophysical adverse effects and benefits of the Project, and to consider the need and purpose of the Project and potential alternatives. These are all issues that go beyond the identification of significant adverse environmental effects.

Before the hearings, the Panel developed a draft sustainability framework and invited comments. At the hearing, the Panel scheduled a topic-specific hearing on cross-cutting issues that included the topic of sustainable development. The framework was then further developed by Panel member Meinhard Doelle with input from other Panel members, and is included in Appendix 8. The Panel made use of this document in developing the analysis in this chapter. The Panel believes that the federal and provincial decision makers may also find it useful in reaching a final decision about the Project.

In the remainder of this chapter, the Panel, to the best of its ability and within the constraints of available information, presents the Panel's key findings with respect to the major components of the assessment, when considering whether the Project would be likely to result in overall benefits, whether the outcome is uncertain, or whether the effect of the Project would likely be negative.

It is worth noting that in contrast to much of the assessment, which focused on the important task of understanding potential adverse effects, the sustainability assessment focuses on whether and how the Project could deliver net benefits. A net contribution to sustainability could be the basis for determining under the *Canadian Environmental Assessment Act* whether significant adverse effects are justified in the circumstances, and whether, under the provincial environmental assessment process, the Project should proceed in light of the Panel's significance findings.

The Panel hopes that the following observations will assist government decision makers in reaching their respective Project decisions.

17.2 WOULD THE PROJECT PROVIDE NET ECONOMIC BENEFITS?

The construction and operation phases of the Project would be very different. During construction, jobs, business opportunities, spin-off opportunities, taxes, and wood utilization opportunities would be among the key economic benefits. For the operation phase of the Project, there would be more limited job opportunities, though these would still likely be important to the local economy. Other long-term economic opportunities would include increased business capacity, opportunities related to the training legacy of the Project and, with the availability of additional lower-cost power in Labrador, opportunities associated with energy security and price stability, and provincial revenues for the life of the Project.

For Innu Nation, there would be considerable economic opportunities associated with the settling of its land claim and the associated control over its economic future. Innu Nation would also receive considerable revenues for the life of the Project, and members of Innu Nation would have training and employment opportunities. Innu Nation companies and joint ventures would have opportunities worth many millions of dollars associated with servicing the needs of the Project.

Adverse economic effects and risks of the Project are moderate, and largely centered around the uncertainties and risks surrounding the viability of the Muskrat Falls facility, and the uncertainty about market access for Gull Island power. If the Muskrat Falls facility were to proceed by itself because market access could not be resolved in a manner that makes Gull Island economically attractive, there is a risk that the Project would not generate sufficient revenues to cover the various mitigation and compensation commitments and needs associated with the Project, or the revenues for the Province necessary to ensure long-term economic benefits, and that it would result in higher power rates for the Island of Newfoundland than would be the case without it. The Panel has therefore recommended a formal financial review and an independent alternatives assessment to resolve these uncertainties and allow for a more accurate assessment of the economic risks.

Other adverse economic effects and risks include the potential challenges associated with existing businesses retaining employees in Happy Valley-Goose Bay, the stress of the Project on some local infrastructure, and the risk of adverse effects associated with a potential economic downturn at the end of the construction phase of the Project. On balance, the risk of these adverse economic effects is moderate.

If the whole Project proceeds, the Panel has reasonable confidence that the adverse economic effects and risks would be outweighed by the potential for large-scale economic benefits. Economic benefits during construction would be centered on jobs and business opportunities, while the dominant economic benefit during operation would arise from the potential revenues the Project would generate for the Province. The financial review recommended by the Panel (Recommendation 4.1) should give government decision makers a better understanding of whether these net economic benefits would materialize.

The results of the alternatives assessment recommended by the Panel (Recommendation 4.2) may affect whether a government decision to permit the Muskrat Falls facility to proceed should be made on the basis of a separate sanction decision by Nalcor, or whether other options, which might include commitments by Nalcor to a Gull Island only or a joint sanction decision for Muskrat Falls and Gull Island, should be considered.

The Panel believes that only after the financial review and alternatives assessment have been completed would government decision makers be in a position to carefully consider whether the Project, under the various scenarios contemplated by Nalcor, would have a net economic benefit, and at what scale.

17.3 WOULD THE PROJECT PROVIDE NET SOCIAL AND CULTURAL BENEFITS?

Jobs, training and education, while offering economic benefits discussed in the previous section, also offer social benefits. In addition, the Project would offer gender equity opportunities and benefits to disadvantaged groups. Mitigation programs, both those proposed by Nalcor and those recommended by the Panel may provide additional social value.

The details of the agreements negotiated between Innu Nation, Nalcor, and federal and provincial governments were not available to the Panel; however, it is reasonable to expect that these agreements would be a catalyst for social and cultural opportunities for the Innu Nation. The Project would provide more opportunity to engage in a wage way of life, including the associated potential social benefits. The Project would also have the potential to result in a better appreciation and commemoration of the cultural heritage of the area.

Increased wages would clearly offer social benefits, but also have a history of contributing to social problems. A key concern among the potential adverse social effects would be the risk of increased drug and alcohol abuse resulting from an influx of money into Labrador communities. This in turn would lead to a range of adverse social consequences.

Individual members of communities in the vicinity of the Project who would not directly benefit from the Project in terms of jobs or increased business but would be affected by adverse social consequences such as increased cost of housing and services, would also be likely to experience some negative social effects. Out-migration from coastal communities would be beneficial to individuals who make this choice, but would have a negative impact on those communities.

The Project would have some negative effect on the culture of Aboriginal communities. Most notable among these effects would be the impact on the reliance on country food. Some of these effects would be direct impacts in the form of displacement of sources of food. Others would be indirect, such as the effect of food advisories, and the perception that country food is contaminated. Other cultural impacts on Aboriginal communities include the cumulative threats to their traditional way of life, the "loss of the river", the loss of sites of cultural importance to Aboriginal communities, and the effect of the Project on Aboriginal elders who are particularly attached to traditional values.

There are reasonable opportunities to reduce adverse social impacts and enhance benefits, but this outcome is not guaranteed based on the current mitigation commitments by Nalcor and the Government of Newfoundland and Labrador. A key question is whether the resources and a sustained effort would be put into assisting interested Labrador communities into a future that supports both a traditional way of life and a wage economy, and does so in a way that allows communities to choose their own path and offers social harmony.

The Panel notes that respect for traditional belief systems and the culture of affected Aboriginal communities by Nalcor and all governments involved would be important in ensuring the healing of the relationship with Aboriginal communities. The efforts made in this regard, in turn, would affect the ability of the Project to deliver net social and cultural benefits.

The Panel also notes that it has limited information on current use of land and resources for traditional purposes. In particular, the Panel is not in a position to assess how complete the information available on use of the Project area by members of NunatuKavut and by Aboriginal communities in Quebec is, making it difficult to conclude on the social and cultural impact of the Project on these communities. Furthermore, the Panel does not have a mandate to assess the strength of claims to Aboriginal rights and titles.

Clearly, the Project has the potential to result in social benefits to residents of Newfoundland and Labrador. Among these benefits are employment opportunities, energy security, improved infrastructure and social services. At the same time, the Project is likely to result in adverse social impacts, in particular to the communities of Happy Valley-Goose Bay and Sheshatshiu, the scale of which would in part, be determined by the commitment to, and success of mitigation measures.

The Panel notes that it is inherently difficult to predict the social and cultural consequences of this Project, as it depends on the choices made by community leaders and individuals within affected communities. Key to a positive social and cultural outcome, therefore, would be an ongoing commitment from all involved to address social issues, conduct careful monitoring, and provide the resources necessary to respond to the unexpected.

The Panel concludes that it is possible but uncertain that the Project as proposed by Nalcor would result in net social benefits. However, there are clearly opportunities to put in place measures on a sustained basis to mitigate negative social effects and enhance social benefits sufficiently so that the Project has the potential to result in net social benefits. Effectively implementing the recommendations in this report would go a long way to achieving this.

17.4 WOULD THE PROJECT HAVE NET BIOPHYSICAL BENEFITS?

The Panel's conclusion with respect to the key biophysical benefits of the Project is addressed in some detail in the Chapter on the Atmospheric Environment, mainly due to the focus on greenhouse gas emission displacement. The key biophysical benefit of the Project would be the displacement of other energy sources that would otherwise produce greater adverse effects. This means that the assessment of the biophysical benefit is linked to an understanding of whether the Project would displace coal, oil, gas, wind, hydro, nuclear, or energy conservation and efficiency efforts.

The quantification of the biophysical effects displaced by the Project is challenging. To reach a firm conclusion, the Panel would have to have accurate information on the sources of energy the Project would displace. Because this information was not available, the Panel can only make general comments about how large-scale hydro projects generally compare with major other sources of electricity. As a starting point, because all other sources of energy have some adverse biophysical effects associated with them, it is safe to conclude that the Project will displace some adverse biophysical effects elsewhere.

From a greenhouse gas emissions perspective, the Project would offer significant advantages over fossil fuel-based energy sources, and be generally comparable to wind, other hydro and nuclear power. Conservation and efficiency measures would rate better than the Project. From a general biophysical perspective, large-scale hydro again tends to rate better than fossil fuel based energy, but does not rate as well as wind or conservation and efficiency measures.

All this means that in order to avoid a net biophysical deficit the Project would have to maximize the displacement of fossil fuel based energy sources, and avoid the displacement of wind and conservation and efficiency measures. For the Island of Newfoundland, the independent alternatives assessment should allow government decision makers to better determine what energy sources the Project would displace. For other markets, the Panel did not receive sufficient information to determine displacement of fossil fuels by the Project but recognized that there would likely be ample opportunity.

Contrary to the uncertainty around potential biophysical benefits, the key adverse biophysical effects are reasonably well understood and assessed in some detail in the Aquatic and Terrestrial Chapters. The Panel in particular made a number of significance findings with respect to fish and fish habitat loss, terrestrial habitat loss, riparian habitat loss, and the risk to the threatened Red Wine Mountain caribou herd. A number of other adverse biophysical effects of the Project were noted in these chapters.

Only in case of displacement of fossil fuel-based power would there be any basis for concluding that the Project would result in a net biophysical benefit. Having said this, it is important to acknowledge the difficulty of comparing the significant adverse effects on the local environment against the concept of displacing greenhouse gas emissions and unspecified biophysical harm elsewhere.

As proposed, the Panel cannot conclude that the Project would result in net biophysical benefits. However, there are opportunities to minimize the biophysical deficit created by the Project. If care is taken to ensure the adverse effects are reduced through the additional mitigation measures proposed, careful monitoring and a commitment of the resources necessary to implement the inevitable adaptive management measures needed to respond to unanticipated consequences, the biophysical deficit can be significantly reduced. If in turn, additional measures are taken to ensure that the power from the Project displaces only fossil fuel based power, and most importantly does not displace renewable energy sources and conservation and efficiency, the Project could result in net biophysical benefits.

Finally, if it is not possible to create net biophysical benefits within the boundaries of the Project, the Panel suggests that consideration be given to compensating for the biophysical deficit through other measures designed to improve environmental protection in Labrador. Among measures that have been suggested to the Panel that deserve some consideration in this regard are a firm commitment to a comprehensive protected areas network in Labrador, and the protection of rivers in Labrador that are as close to the Churchill River as possible in terms of their biophysical characteristics.

17.5 WOULD THERE BE NET BENEFITS TO FUTURE GENERATIONS?

Long-term energy security would be among the key benefits to future generations. The Panel observes that because of the existing Churchill Falls project, the long-term energy security for the province is already secure after 2041, so the main benefit to future generations in this regard would accrue to the rest of North America. Another potential benefit to future generations would be the predicted large-scale provincial revenues. Whether and at what scale these would be realized would depend on a number of factors, including whether the whole Project proceeds, whether economic access to markets can be realized, and the future of electricity demand and supply.

For Innu Nation, the Project offers the opportunity to control its own future. However, at the same time, part of its traditional lands would be flooded and it would lose part of its heritage in the form of the "loss of the river", along with a number of culturally important sites. The "loss of the river" is also generally a loss to future generations, well beyond Innu Nation.

Finally, and perhaps most importantly, future generations bear the risk and uncertainty that the predictions made about the benefits and adverse effects of the Project could turn out to be overly optimistic. The Panel has concluded that there are considerable uncertainties in the predictions about biophysical, social, cultural and economic effects of the Project. There are also considerable uncertainties about the effectiveness of mitigation measures.

The Panel has sought to make recommendations to reduce these uncertainties and risks, but many remain. Furthermore, the track record of full implementation of mitigation measures, monitoring and adaptive management commitments as a result of environmental assessments is mixed. All this leaves considerable uncertainty about the effect of the Project on future generations. Only a firm commitment to mitigation, monitoring and active adaptive management can serve to reduce this uncertainty.

17.6 WOULD THERE BE NET BENEFITS TO NEWFOUNDLAND AND LABRADOR?

The effect of the Project on the province has been a primary focus of the overall report. The economic, social and environmental effects, risks and uncertainties are summarized in the

respective sections above. The realization of net benefits to the province of Newfoundland and Labrador would largely depend on large-scale economic benefits, and the effective mitigation of social and environmental impacts. The overall social impacts would likely be mixed, and a large-scale persistent effort would be needed to avoid a significant biophysical deficit to the province.

Net benefits to Labrador are even more dependent on a large-scale mitigation and adaptive management effort with respect to adverse social and biophysical effects expected for a long time to come. Labrador has the potential to benefit from the availability of power from the Project. While the social effects could likely be fully mitigated given adequate resources and time and could be expected to diminish after the construction period is over, the residual environmental effect, though much reduced, would still be negative for Labrador.

It is not clear based on the evidence before the Panel whether the Project would generate sufficient surplus revenues to cover the cost of this long-term mitigation and adaptive management effort, particularly with respect to the Muskrat Falls only scenario. The formal financial review should enable government decision makers to confirm whether this is a valid concern. A related concern expressed by many participants was that there is no firm financial commitment by either Nalcor or the Province to ensure sufficient resources are allocated to this effort over the long term, an issue that is addressed in the Panel recommendations. The Panel also heard much about the uneven distribution of costs and benefits between the Island of Newfoundland and the Labrador mainland.

The full Project would likely deliver net benefits to the Province. Whether it would also deliver net benefits to Labrador depends on whether enough of the revenues generated from the Project are re-invested in Labrador to ensure a net benefit.

If Muskrat Falls only proceeds on the basis that it would be needed to meet Island energy needs, then it is much less clear that the Project will result in net benefits to the Province as a whole or to Labrador. The financial and alternatives assessments would go a long way to confirming whether a net benefit is likely under such a scenario.

In case of a delay with the Gull Island component, the Panel has concluded that the benefits would generally be less and the adverse effects greater than the preferred scenario with overlapping construction. The overlapping construction scenario is therefore preferable from a net benefits perspective.

17.7 WOULD THERE BE NET BENEFITS BEYOND NEWFOUNDLAND AND LABRADOR?

The Panel notes that the effects of the Project would extend beyond the province of Newfoundland and Labrador. There would be job opportunities for workers in the rest of Canada and beyond and opportunities throughout North America to use the power from the Project to reduce greenhouse gas emissions and other adverse impacts of other sources of energy. There are significant business opportunities beyond the province of Newfoundland and Labrador, and the Project has the potential to contribute to price stability and energy security in other jurisdictions.

There is also potential for the Project to have adverse effects beyond the province. Most notably, Aboriginal communities in Quebec are concerned that their use of land and resources, and their rights and title may be adversely affected by the Project. Finally, other economic opportunities elsewhere may be foreclosed if the Project proceeds.

Overall, the Panel is of the view, based on the information available to it, that the Project is likely to offer net benefits to jurisdictions beyond the province of Newfoundland and Labrador.

17.8 WOULD THERE BE NET BENEFITS TO INDIVIDUAL COMMUNITIES?

The Panel considered the effects, risks and uncertainties for individual communities in some detail throughout the report. Appendix 5 includes a summary of what the Panel heard at the various community sessions. The Panel's assessment and conclusions on community effects and benefits are discussed in Chapters 8, 9, 12 and 13. The following is a summary of the Panel's key findings for Happy Valley-Goose Bay, the Innu communities in Labrador, other Labrador communities, and Aboriginal communities in Quebec.

The community of Happy Valley-Goose Bay would likely be among the communities most directly affected by the Project, both positively and negatively. On the positive side, Happy Valley-Goose Bay would have every opportunity to ensure it received a major share of the economic benefits from the construction phase of the Project.

The ability to turn this economic benefit into a long-term benefit would depend on a number of factors. It would depend on whether the whole Project proceeds, and whether there would be an overlap in construction between the two components. It would also depend on the future of the military base and the ability to attract other business opportunities by the end of the construction period.

Happy Valley-Goose Bay would encounter a range of social challenges, among them a shortage of housing, a possible workforce shortage, increased drug and alcohol abuse, and an increase in violence against women and children. With appropriate mitigation, including those recommended by the Panel, a concerted monitoring effort and active adaptive management, there would be every opportunity to address these social impacts and ensure net benefits to Happy Valley-Goose Bay.

The overall effect of the Project on Sheshatshiu would be complex and uncertain. The settlement of Innu Nation's Land Claim, for which the Project clearly was a catalyst, would give the community much more control over its future. Furthermore, the *Tshash Petapen* Agreement would provide the community with the resources to address many of the serious social challenges it is facing. In short, there is every opportunity for the Project to be a good news story for the community, however, getting to that point would be a complex process that would likely require effective responses to many unexpected challenges.

Of the remaining communities, Mud Lake is closest to the Project and the area directly affected by it. Mud Lake could experience transportation disruptions during impoundment and also potentially at the time of freeze-up and break-up for the life of the Project. Mud Lake residents were also concerned about possible navigation changes and would be most at risk should a dam failure occur. The combined effect of these impacts, about which there is still considerable uncertainty, evidently made residents concerned about the future viability and character of their community. Mud Lake, North West River and possibly Rigolet, would be affected if consumption advisories were required in Lake Melville and by other possible consequences of downstream Project effects. At the same time, some members of these communities would be able to take advantage of the job and business opportunities the Project would provide, particularly during the construction phase.

The Panel concludes that these three communities would likely not receive a net benefit from the Project, unless a number of residents obtained employment with the Project. The

communities would likely only be significantly affected if downstream effects turn out to be much worse than predicted by Nalcor. However the Panel notes that Mud Lake is at somewhat greater risk of negative impact if effects turn out to be worse than predicted or if mitigation is not effective. If the Project is approved, it will be important to actively engage these communities in ongoing monitoring and adaptive management efforts. Further efforts requiring modest resources could be undertaken to ensure net benefits to each of these communities. If the Project is approved, the Panel encourages Nalcor and the Province to actively engage with each of these communities.

The Panel concludes that the effect of the Project on Cartwright and Nain would likely be neutral. There is some risk of minor adverse effects, such as the effects of out-migration, but also some potential for jobs, training and business opportunities for members of these communities. The risk of direct adverse effects from the Project on these communities would be small.

The Panel heard from seven Aboriginal communities in the province of Quebec that have made claims to rights and titles in the Project area, six of which presented to the Panel at community sessions held in Sept-Îles. As it is not within the mandate of the Panel to assess the nature or strength of these claims, the Panel is not in a position to comment on whether, or to what extent, there is a legal requirement to accommodate the concerns expressed.

The Panel received only anecdotal information on current use within the Project area by members of Aboriginal communities in Quebec. Nalcor's position on current use by Aboriginal communities in Quebec was that these communities make no or minimal use of the area likely to be affected by the Project. The information provided directly by Quebec Aboriginal communities was provided with the understanding that it was incomplete, and that sufficient time and resources were not made available to these communities to provide a complete picture of current use.

Most of the information about current use was provided by Chiefs and Elders from the community. Without common reference points and local knowledge, the Panel was not in a position to assess how much of the use discussed was in the Project area. As a result, the Panel was not in a position to assess the impact of the Project on current use by Quebec Aboriginal communities, although, based on the limited information presented, it would appear that the main current use of the Project area would be to hunt caribou.

In conclusion, the extent of the adverse impact on rights and title and current use on Aboriginal communities in Quebec could not be assessed by the Panel due to limits in its mandate and due to information gaps with respect to current use. Furthermore, there is no clear evidence of substantial benefits to these communities. This means that if there is a negative impact on the rights, titles, or current use by a given community, the net effect of the Project on that community would likely be negative unless additional steps are taken. Otherwise, the net effect of the Project on that community would likely be neutral.

It seems clear that these communities, to varying degrees, have suffered from impacts from previous developments without their consent and without meaningful consultation. Governments would be well advised to consider this history and make every effort to meaningfully engage with these communities before a Project decision is made.

17.9 CONCLUDING THOUGHTS ON THE FINAL PROJECT DECISION

If the financial review and alternatives assessments recommended by the Panel were to show that there are alternative ways of meeting the electricity demands of the Island over the medium term in a manner that is economically viable and environmentally and socially responsible, the Project should likely not be permitted to proceed for purposes of meeting Island demand. This is critical for the Muskrat Falls facility, because meeting Island demand has been put forward as its main justification.

If the Gull Island facility were to be developed first, or a joint sanction decision were to be made, this would be a different situation as the Gull Island facility would produce more power at a lower unit cost and therefore would offer much greater potential for revenue generation from the export of power. If market access for Gull Island were to be resolved, the cost of bringing Gull Island power to market would have to be carefully assessed by government decision makers. With this information and the projected price of power in accessible markets, the potential of the Project to provide lower cost power to Newfoundland and Labrador and generate revenues for the Province could then be assessed (see Recommendation 4.1).

The effect of the Project on Aboriginal rights and title as well as the effect on current use by Aboriginal communities has to be fully understood and agreement should be reached with affected communities on how any impacts will be addressed. These issues could be addressed together in the context of the federal consultation framework. In case of any impact on current use, Nalcor would then be asked to address the impacts identified. This would ensure that the process of repairing the relationships with Aboriginal communities could continue, and would ensure that the full costs of proceeding with the Project are understood.

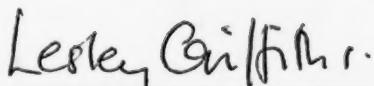
At the hearing, the Panel heard a number of presenters from Labrador say that they had struggled long and hard to reach a personal decision about the merits of the Project, recognizing that it would deliver both local benefits, particularly during construction, and adverse effects including the "loss of the river". The Panel can certainly empathize with this struggle, and is aware that some readers of this report, hoping for a simple verdict (and particularly one that matches their own particular views) may be dismayed at the emphasis placed on caution, balancing, and conditional conclusions. The Panel maintains however that this is the only reasonable and responsible approach in what are very complex circumstances.

As the Panel observed in its closing remarks at the last day of the hearings, the five Panel members began the process with open minds. Throughout the review we have enquired, listened, and sought to understand to the best of our ability.

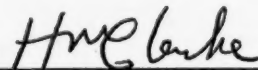
Finally, the Panel wants to thank everyone who participated in the review - individuals and organizations, communities, Aboriginal groups, governments and Nalcor. Your hard work, persistence, and willingness to provide information and share experience, knowledge, ideas and aspirations with the Panel was invaluable. The Panel writes the report but the environmental assessment as a whole is truly a collective effort. It is our hope that all participants in this environmental assessment feel that they have both contributed to the conclusions and recommendations reached and have learned from other participants during the course of the process.

Joint Review Panel for the Environmental Assessment of the Lower Churchill Hydroelectric Generation Project

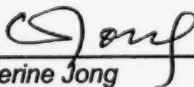
Dated: August 23, 2011



Lesley Griffiths
Panel Co-Chair



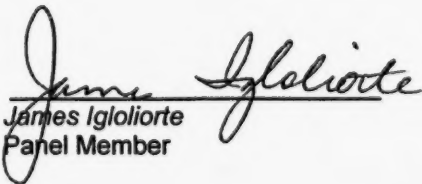
Herbert Clarke
Panel Co-Chair



Catherine Jong
Panel Member



Meinhard Doelle
Panel Member



James Igloliorte
Panel Member

APPENDIX 1 LIST OF RECOMMENDATIONS

RECOMMENDATION 4.1 Government confirmation of projected long-term returns

The Panel recommends that, if the Project is approved, before making the sanction decision for each of Muskrat Falls and Gull Island, the Government of Newfoundland and Labrador undertake a separate and formal review of the projected cash flow of the Project component being considered for sanctioning (either Muskrat Falls or Gull Island) to confirm whether that component would in fact provide significant long-term financial returns to Government for the benefit of the people of the Province. Such financial returns must be over and above revenues required to cover operating costs, expenditures for monitoring, mitigation and adaptive management, and financial obligations to Innu Nation. The Panel further recommends that the Government of Newfoundland and Labrador base these reviews on information on energy sales, costs and market returns that have been updated at the time of sanction decision, and make the results of the reviews public at that time. The financial reviews should also take into account the results of the independent alternatives assessment recommended in Recommendation 4.2.

RECOMMENDATION 4.2 Independent analysis of alternatives to meeting domestic demand

The Panel recommends that, before governments make their decision on the Project, the Government of Newfoundland and Labrador and Nalcor commission an independent analysis to address the question "What would be the best way to meet domestic demand under the 'No Project' option, including the possibility of a Labrador-Island interconnection no later than 2041 to access Churchill Falls power at that time, or earlier, based on available recall?" The analysis should address the following considerations:

- why Nalcor's least cost alternative to meet domestic demand to 2067 does not include Churchill Falls power which would be available in large quantities from 2041, or any recall power in excess of Labrador's needs prior to that date, especially since both would be available at near zero generation cost (recognizing that there would be transmission costs involved);
- the use of Gull Island power when and if it becomes available since it has a lower per unit generation cost than Muskrat Falls;
- the extent to which Nalcor's analysis looked only at current technology and systems versus factoring in developing technology;
- a review of Nalcor's assumptions regarding the price of oil till 2067, since the analysis provided was particularly sensitive to this variable;
- a review of Nalcor's estimates of domestic demand growth (including the various projections to 2027 in the EIS (2007, 2008, 2009 and the 0.8 percent annual growth to 2067 provided at the hearing);
- Nalcor's assumptions and analysis with respect to demand management programs (compare Nalcor's conservative targets to targets and objectives of similar programs in other jurisdictions and consider the specific recommendations, including the use of incentives to curtail electric base board heating, from Helios Corporation, among others);
- the suggestion made by the Helios Corporation that an 800 MW wind farm on the Avalon Peninsula would be equivalent to Muskrat Falls in terms of supplying domestic needs, could be constructed with a capital cost of \$2.5 billion, and would have an annual operating cost of \$50 million and a levelized cost of power of 7.5 cents per kilowatt-hour;
- whether natural gas could be a lower cost option for Holyrood than oil; and

- potential for renewable energy sources on the Island (wind, small scale hydro, tidal) to supply a portion of Island demand.

RECOMMENDATION 4.3 Integrated Resource Planning

The Panel recommends that the Government of Newfoundland and Labrador and Nalcor consider using Integrated Resource Planning, a concept successfully used in other jurisdictions. Such an approach would involve interested stakeholders and look simultaneously at demand and supply solutions and alternative uses of resources over the medium and long term.

Recommendation 4.4 Project sequencing and applying lessons learned

The Panel recommends that, if the Project is approved, and if for any reason construction of the Gull Island portion of the Project occurs before Muskrat Falls, Nalcor should be expected to apply the lessons learned from the construction of Gull Island to the construction of Muskrat Falls.

RECOMMENDATION 4.5 Full clearing of the Muskrat Falls reservoir

The Panel recommends that, if the Project is approved, Nalcor be required to apply its 'full clearing' reservoir preparation option to the Muskrat Falls reservoir.

RECOMMENDATION 4.6 Preparation approach for Gull Island reservoir

The Panel recommends that, if the Project is approved, the reservoir preparation approach for the Gull Island reservoir be finalized and approved by the provincial Department of Natural Resources at the time of the sanction decision for Gull Island. The approach should take into account lessons learned from the preparation of the Muskrat Falls reservoir and should make all reasonable effort to increase harvested volumes above those currently projected by Nalcor under its 'partial clearing' option for the Gull Island reservoir.

RECOMMENDATION 4.7 Utilization of merchantable timber

The Panel recommends that, if the Project is approved, Nalcor be required to ensure utilization of both the harvested timber from reservoir preparation and the merchantable wood taken from the reservoir as part of its 'trash and debris' removal program after impoundment. Nalcor would retain the right to determine how this would be achieved, but should work with relevant Provincial Government departments and third party commercial interests to identify options.

RECOMMENDATION 5.1 Use of best available technology

The Panel recommends that, if the Project is approved, Nalcor be required to implement its mitigation commitments to minimize air pollution, noise and greenhouse gas emissions resulting from the Project. In addition, Nalcor should be required to use best available technology for any new construction and harvesting equipment purchased for the Project. This means that any new equipment purchased after Project approval should be required to meet the highest current emissions standards for such equipment, even if such standards are above current regulatory requirements.

RECOMMENDATION 5.2 Backing up intermittent renewable energy

The Panel recommends that, if the Project is approved, Nalcor be required to make all reasonable efforts to maximize the potential to utilize power from the Project to back-up wind power and other intermittent renewable sources of electricity. The results of Nalcor's efforts should be reported to the public through its annual report.

RECOMMENDATION 5.3 Displacement of high greenhouse gas energy sources

The Panel recommends that, if the Project is approved, Nalcor be required to take all reasonable steps to ensure that power from the Project is used to displace energy from high

greenhouse gas emission sources and does not displace demand management, conservation, efficiency, and the generation of power from renewable, low greenhouse gas emission energy sources. The results of Nalcor's efforts should be reported to the public through its annual report.

RECOMMENDATION 5.4 Atmospheric monitoring

The Panel recommends that, if the Project is approved and in addition to its monitoring commitments, Nalcor should carry out the following monitoring programs using methodologies approved by federal and provincial regulators:

- monitor greenhouse gas emissions related to construction;
- monitor greenhouse gas emissions related to operation;
- track the displacement of greenhouse gas emissions in the various markets for Project power and report annually based on transparent methodologies approved by federal and provincial regulators, taking into account relevant issues identified by the Panel; and
- work with appropriate government agencies to ensure that there are active climate change monitoring programs on appropriate rivers in Labrador not affected by the Project, so that there is a better chance to separate Project impacts from climate change impacts based on local weather data collected within the Project area.

RECOMMENDATION 6.1 Timing of reservoir impoundment

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to carry out impoundment of both the Muskrat Falls and Gull Island reservoirs during the period mid-July to the end of September, and to prepare a detailed mitigation plan for approval by Fisheries and Oceans Canada. The mitigation plan should include information on how the effects of dewatering would be monitored, thresholds to trigger further mitigation, and identification of specific adaptive management measures and how they would be applied.

RECOMMENDATION 6.2 Environmental flow standards

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation, in consultation with Fisheries and Oceans Canada, Nalcor, Churchill Falls (Labrador) Corporation Limited, and Aboriginal groups and stakeholders, develop environmental flow standards for the lower Churchill River with respect to flows (magnitude, frequency, duration, timing, and rate of change) designed to promote the maintenance of ecological functions and the conservation of riparian and fish habitat. The environmental flow standards should be incorporated by regulation under appropriate provincial legislation and acknowledged in the Water Management Agreement. The Panel further suggests that the Department of Environment and Conservation consider developing environmental flow standards for the upper Churchill River, recognizing the importance of addressing the entire watershed as an integrated system.

RECOMMENDATION 6.3 Erosion and sedimentation prevention

The Panel recommends that, if the Project is approved, Nalcor be required to prepare an erosion and sedimentation prevention strategy including the use of 15-metre vegetated buffer areas during reservoir preparation, best practices at all construction and cleared areas, and specified adaptive management measures to be applied should these mitigation measures fail.

RECOMMENDATION 6.4 Mitigating entrainment effects

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to take the following steps before receiving a Section 35(2) authorization with respect to potential entrainment losses: (a) carry out further baseline sampling at Gull Island to verify both juvenile and adult fish movements in this area; and (b) prepare a mitigation and adaptive

management strategy that establishes thresholds for further action, and identifies what adaptive measures would be taken when, and for what species. The strategy should also address compensation measures should it become apparent that high losses of a specific species are inevitable.

RECOMMENDATION 6.5 Pilot study for methylmercury mitigation through soil removal

The Panel recommends that Natural Resources Canada, in consultation with Nalcor and, if possible, other hydroelectricity developers in Canada, carry out a pilot study to determine (a) the technical, economic and environmental feasibility of mitigating the production of methylmercury in reservoirs by removing vegetation and soils in the drawdown zone, and (b) the effectiveness of this mitigation measure. The pilot study should take place in a location where the relevant parameters can be effectively controlled (i.e. not in the Lower Churchill watershed) and every effort should be made to complete the pilot before sanction decisions are made for Gull Island. If the results of the pilot study are positive, Nalcor should undertake to employ this mitigation measure in Gull Island to the extent possible and monitor the results.

RECOMMENDATION 6.6 Fish habitat compensation

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to:

- prepare a detailed fish habitat compensation plan in consultation with stakeholders and Aboriginal groups that addresses to the extent possible the likely interactions between species and life stages, including predator-prey relationships and also the potential to replace tributary-type habitats;
- prepare a habitat monitoring plan including thresholds for further action and identified adaptive management measures;
- implement the proposed plan, documenting the process;
- evaluate the extent to which new, stable habitat has been created, its use and productivity; and
- apply any lessons learned from implementing the Muskrat Falls compensation plan to the proposed Gull Island compensation works.

If, after all feasible adaptive management measures have been applied, Fisheries and Oceans Canada determines that there has been a significant shortfall in the amount of habitat successfully created and maintained, compared to the original proposal, Nalcor should be required to compensate by carrying out habitat compensation works in other watersheds in Labrador. Preference should be given to remediation and enhancement in areas adversely affected by the Churchill Falls project.

RECOMMENDATION 6.7 Assessment of downstream effects

The Panel recommends that, if the Project is approved and before Nalcor is permitted to begin impoundment, Fisheries and Oceans Canada require Nalcor to carry out a comprehensive assessment of downstream effects including:

- identifying all possible pathways for mercury throughout the food web, and incorporating lessons learned from the Churchill Falls project;
- baseline mercury data collection in water, sediments and biota, (revised modelling taking into account additional pathways, and particularly mercury accumulation in the benthos) to predict the fate of mercury in the downstream environment;
- quantification of the likely changes to the estuarine environment associated with reduction of sediment and nutrient inputs and temperature changes; and
- identification of any additional mitigation or adaptive management measures.

The results of this assessment should be reviewed by Fisheries and Oceans Canada and by an independent third-party expert or experts, and the revised predictions and review comments discussed at a forum to include participation by Aboriginal groups and stakeholders, in order to provide advice to Fisheries and Oceans Canada on next steps.

RECOMMENDATION 6.8 Published analysis of downstream effects over time

The Panel recommends that, if the Project is approved, Nalcor contribute to the overall knowledge about the effects of hydroelectric projects in northern regions by ensuring that a longitudinal analysis of the effects of the Project on the downstream environment (Goose Bay and Lake Melville) over an appropriate time period, including both mercury transport and bioaccumulation and other ecological parameters, is published in a peer-reviewed journal or the equivalent. The Panel suggests that Nalcor consider collaborating with an appropriate independent research organization to carry out this recommendation by providing knowledge, data and financial resources.

RECOMMENDATION 6.9 Development of the aquatic monitoring program

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to organize a workshop with third-party facilitation and invited participation by Aboriginal groups, stakeholder organizations, knowledgeable local people, and independent experts from academic or equivalent organizations to review and advise on a detailed draft monitoring plan.

RECOMMENDATION 7.1 Wetland compensation plan

The Panel recommends that, if the Project is approved, Nalcor be required to develop a detailed wetland compensation plan in consultation with Environment Canada, the provincial Department of Environment and Conservation, Aboriginal groups and appropriate stakeholders. The plan should set appropriate goals for the re-establishment of wetlands taking into account the purpose served by each type of wetland in the context of the surrounding ecosystem.

RECOMMENDATION 7.2 Riparian compensation plan

The Panel recommends that, if the Project is approved, Fisheries and Oceans Canada require Nalcor to develop a detailed riparian habitat compensation plan in consultation with Fisheries and Oceans Canada, the provincial Department of Environment and Conservation, Aboriginal groups and appropriate stakeholders, that looks closely at water levels and variations in the levels needed to ensure healthy and resilient riparian habitat and coordinates with the environmental flow standards referenced in recommendation 6.2.

RECOMMENDATION 7.3 Recovery strategies for endangered species

The Panel recommends that, if the Project is approved, federal and provincial governments make all reasonable efforts to ensure that recovery strategies are in place and critical habitat is identified for each listed species found in the assessment area before a final decision is made about the effects of the Project on those species. Compliance with federal and provincial species protection legislation should be seen as a minimum standard. In fairness to Nalcor, this work should be given the priority needed to ensure that the Project decision is not unduly delayed. A final Project decision should only be made once government decisionmakers are satisfied that the recovery of listed species would not be compromised by the Project. Where Environment Canada is relying on provincial efforts to fulfill its obligations under the safety net provisions of the federal *Species at Risk Act*, before a federal decision is made about the Project it should satisfy itself that the provincial efforts for any species at risk are sufficient for its recovery and will not be compromised by the Project.

RECOMMENDATION 7.4 Compliance with species at risk legislation

The Panel recommends that, if the Project is approved, Nalcor should work with federal and provincial departments responsible for species at risk legislation to ensure all Project-related activities comply with restrictions and prohibitions against harassment, disturbance, injuring or killing of listed species or destroying and disturbing their residence.

RECOMMENDATION 7.5 Road construction and decommissioning

The Panel recommends that, if the Project is approved, the provincial Department of Natural Resources require Nalcor to minimize road construction outside the reservoirs, by locating new roads inside the impoundment area as much as possible. Any new roads proposed by Nalcor to be located outside the impoundment areas should be carefully reviewed by the Forestry Branch of the Department of Natural Resources and only approved if there is no reasonable alternative. In order to ensure that conservation objectives are met, all temporary roads outside the reservoir should be decommissioned as soon as possible to the satisfaction of the provincial Department of Environment and Conservation.

RECOMMENDATION 7.6 Recovery of the Red Wine Mountain caribou herd

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation ensure that adequate resources are available so that all reasonable efforts to ensure the recovery of the Red Wine Mountain caribou herd are taken. In addition, the Department should require Nalcor to play an enhanced role in the recovery process for the Red Wine Mountain caribou herd by putting resources into the process for research and recovery efforts and to participate actively in the overall effort to ensure the recovery of the caribou herd.

RECOMMENDATION 7.7 Management of the George River caribou herd

The Panel recommends that, if the Project is approved, the provinces of Quebec and Newfoundland and Labrador, Environment Canada and all interested Aboriginal communities initiate a dedicated range-wide joint management program for the George River caribou herd, and through this program cooperatively carry out a comprehensive cumulative effects assessment of the impact of human activities on the herd to be updated periodically as required.

RECOMMENDATION 7.8 Effect of reservoir preparation activities on migratory birds

The Panel recommends that, if the Project is approved, Nalcor and Environment Canada negotiate an agreement prior to reservoir preparation regarding whether and how clearing could proceed between May and July without violating the *Migratory Birds Convention Act*. To initiate this process, Nalcor should be required to submit a plan describing how it would carry out clearing activities during this period in compliance with the *Migratory Birds Convention Act*.

RECOMMENDATION 7.9 Vegetation control

The Panel recommends that, if the Project is approved, Nalcor be required to restrict the use of chemical herbicides to areas where alternative vegetation control is not reasonably possible. Approval of the use of herbicides should only be granted after Nalcor has submitted an overall vegetation control plan to the provincial Department of Environment and Conservation, demonstrating that all alternatives have been adequately explored and the use of non-chemical approaches maximized.

RECOMMENDATION 7.10 Monitoring, follow-up and adaptive management for the terrestrial environment

The Panel recommends that, if the Project is approved and in addition to its monitoring commitments listed in Chapter 7, Terrestrial Environment, Nalcor should carry out the following monitoring programs:

- monitor the effectiveness of riparian and wetland habitat compensation work, including the effect on wetland sparrows;
- monitor the response of the Red Wine Mountain caribou herd including any population changes through the construction phase and in the early part of the operation phase;
- monitor wolf predation of caribou, particularly the Red Wine Mountain herd;
- monitor interactions of the George River caribou herd with Project activities and facilities and identify any impacts;
- monitor ashkui formation in the Project area;
- monitor direct and indirect impacts on waterfowl, such as waterfowl adjustment to changes in riparian habitat, and changes in the location and formation of ashkui;
- confirm the presence of and monitor the impact of the Project on salamanders and spring peepers;
- develop a detailed mitigation and monitoring plan for all listed species for approval by the provincial Department of Environment and Conservation;
- confirm the presence outside the flood zone of the eight plant species identified by Nalcor as unique to the river valley plus the two additional species listed by the Department of Environment and Conservation (marsh horsetail and hidden fruit bladderwort) and develop a detailed mitigation plan for these plant species for approval by the Department;
- monitor the impact of the Project on furbearers, small game, small mammals, and black bears; and
- collaborate with the Department of Environment and Conservation to develop an appropriate approach to monitor pine marten in areas affected by the Project where there is no trapping activity.

RECOMMENDATION 8.1 Trapping compensation program

The Panel recommends that, if the Project is approved, Nalcor be required to establish a compensation program for all bona fide trappers along the lower Churchill River, without requiring proof of ten years' use as an entry point. Instead, compensation should be commensurate with the total extent of trapping activity during the previous ten years, as shown by the recorded income attributable to the Project area. Compensation should be awarded within six months after an individual trapper has established eligibility.

RECOMMENDATION 8.2 Mud Lake Ice bridge mitigation

The Panel recommends that, if the Project is approved, Nalcor, the Government of Newfoundland and Labrador and the Mud Lake Improvement Committee negotiate an agreement to address how any future adverse changes to the ice bridge that would lengthen the existing period of time when residents are unable to cross the river by boat or snowmobile would be assessed and mitigated. Alternative transportation options should be provided if travel across the river is prevented during the freeze-up or break-up for periods in excess of two weeks. The selected solution should adequately meet the residents' needs for everyday and emergency travel and should respect the character of the community. Road access should not be imposed on the community as a solution to address ice bridge changes without its consent. The primary onus to cover the costs of this mitigation should be placed on Nalcor. The agreement should also address the role of the Province in mitigating any cumulative effects caused by climate change.

RECOMMENDATION 8.3 Navigation during impoundment

The Panel recommends that, if the Project is approved, Nalcor be required to develop a mitigation plan in consultation with the Mud Lake Improvement Committee to address temporary transportation difficulties during reservoir impoundment periods. If transportation is impeded,

Nalcor should provide and pay for alternative transportation that minimizes inconvenience to the residents.

RECOMMENDATION 8.4 Lower Churchill navigation mitigation and monitoring plan

The Panel recommends that, if the Project is approved, Transport Canada require Nalcor to develop a mitigation and monitoring plan for each reservoir, in consultation with river users, to address navigation issues on the river, including both reservoirs and the downstream portion of the main stem. The plan would address (a) navigation issues during the construction and impoundment periods, (b) provision of boat launches and portages, (c) identification of areas that need to be cleared before impoundment to create safe shoreline access areas for small boats, (d) management of the stick-up zones, including how and when Nalcor would manually remove trees left standing three years after impoundment, (e) management of trash and debris in the reservoirs, (f) charts to show navigational hazards, signage and information, and (g) monitoring and specific adaptive management measures to address any navigational problems downstream from Muskrat Falls.

RECOMMENDATION 8.5 Allowing local forestry operators to clear additional areas

The Panel recommends that, if the Project is approved, the provincial Department of Natural Resources require Nalcor to allow local forestry operators to clear timber from areas not otherwise scheduled to be cleared, provided they can demonstrate a safe approach. Nalcor should be required to pay the stumpage fees for the forestry operators salvaging the extra timber.

RECOMMENDATION 9.1 Noise and dust management

The Panel recommends that, if the Project is approved, and to avoid disturbance of persons carrying out traditional land and resource use activities, Nalcor be required to monitor and manage construction traffic and borrow pit activities to minimize dust problems, noise and sleeping disturbance for occupants of cabins and camps along the roads.

RECOMMENDATION 9.2 Relocation of Canada yew

The Panel recommends that, if the Project is approved, Nalcor be required to collaborate with Innu Elders on where and how to relocate Canada yew plants, conduct regular field visits with Elders for assessment, and employ any adaptive management procedures required to maintain a stable population of the plant.

RECOMMENDATION 9.3 Community level land and resource use monitoring

The Panel recommends that, if the Project is approved, Nalcor involve all Aboriginal groups in the design and implementation of its proposed community land and resource use monitoring program for the duration of the construction period to ensure that parameters of importance to these groups and Traditional Knowledge are included.

RECOMMENDATION 11.1 Involvement of Aboriginal groups in the management and protection of historic and archaeological resources

The Panel recommends that, if the Project is approved, Nalcor, in collaboration with the Provincial Archaeology Office, establish and support a program to involve all three Labrador Aboriginal groups in (a) the documentation and interpretation of known historic and archaeological sites and artifacts and (b) the process to be followed in the case of inadvertent discoveries of previously unknown sites and artifacts during construction, including notification of the three groups. Nalcor should also give consideration to inviting participation by interested Aboriginal communities in Quebec. Nalcor should share with Aboriginal groups the results of its work on the monitoring of historic and archaeological resources to be compiled and provided annually to the Provincial Archaeology Office.

RECOMMENDATION 11.2 Commemoration initiatives

The Panel recommends that, if the Project is approved, Nalcor work in collaboration with local communities and Aboriginal groups to (a) identify sites, artifacts and intangible elements (including portages, traplines, trails and personal stories) to be documented and commemorated, (b) determine how commemoration should occur and (c) implement specific commemorative initiatives (such as plaques and story boards) at appropriate locations in communities and throughout the river valley. Local heritage organizations could benefit by receiving funding to undertake part of this work and to implement education and interpretation programs.

RECOMMENDATION 11.3 – Naming Project-related features

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador develop an approach to the naming of Project-related features in consultation with local communities and Aboriginal groups that recognizes the importance of place names in Aboriginal cultures.

RECOMMENDATION 12.1 Early candidate selection and training

The Panel recommends that, if the Project is approved, Nalcor take a more proactive approach to providing early and specific training programs to certain Labrador candidates. This approach could include measures such as early candidate selection, conditional letters of intended employment, and, on-the-job training at other Nalcor operations or with other entities with which Nalcor has influence.

RECOMMENDATION 12.2 Workplace attachment for apprenticeship graduates

The Panel recommends that, if the Project is approved, Nalcor commit to providing workplace attachment for both first and second year graduates of apprenticeship programs to the maximum extent possible.

RECOMMENDATION 12.3 Training to 'journey person' level in community of residence

The Panel recommends that, if the Project is approved, relevant provincial departments commit to explore with Nalcor, other educational entities and agencies and relevant communities in Labrador, how to implement to the extent practical, training to 'journey person' level in the community of residence.

RECOMMENDATION 12.4 Address wage subsidy stigma

The Panel recommends that, if the Project is approved, to the extent that wage subsidies might be available and used for new job entrants, Nalcor implement an education and communications program to address and remove the stigma that some might feel is associated with such a practice.

RECOMMENDATION 12.5 Preparing for participation in wage economy

The Panel recommends that, if the Project is approved, Nalcor develop and implement, in consultation with Aboriginal groups, an appropriate orientation and information process to assist prospective employees who might have little or no experience of participation in a wage economy. Nalcor should also expand training programs to include, in addition to skills training, training to equip potential Aboriginal employees to deal with various financial, social and cultural challenges as a result of employment in the construction industry. In consultation with Aboriginal groups, Nalcor should also consider providing additional money management programs such as payroll saving schemes.

RECOMMENDATION 12.6 Continuation of Labrador Aboriginal Training Partnership

The Panel recommends that, if the Project is approved, Nalcor support the continuation of the Labrador Aboriginal Training Partnership beyond 2012, including making a financial contribution

if required to both enable current participants to complete their training and to meet additional training requirements.

RECOMMENDATION 12.7 Employment outreach to Quebec Aboriginal communities

The Panel recommends that, if the Project is approved, Nalcor initiate an employment outreach program for interested Aboriginal groups in Quebec; such a program could include among other measures, a specific recruitment program, transportation assistance from Sept-Iles, and measures to address social and cultural issues including any associated language barriers.

RECOMMENDATION 12.8 Quantitative targets for goods and services

The Panel recommends that, if the Project is approved, the concept of quantitative objectives or targets be applied to the provision of goods and services, with targets established both for the province as a whole, and for Labrador.

RECOMMENDATION 12.9 Enhanced supplier development program

The Panel recommends that, if the Project is approved, Nalcor enhance its supplier development program by implementing the following measures: (a) establish the Labrador Business Opportunities Committee and appoint the full time Coordinator in Happy Valley-Goose Bay as soon as possible, (b) ensure the Coordinator (a Nalcor employee) has sufficient seniority within the organization to influence relevant procurement decisions and has full access to all procurement information and related decision making, (c) release as soon as possible the list of goods and services required by the Project, with specific indications of time frame, approximate volumes and dollar values or ranges as appropriate, and (d) ensure immediately that all engineering management personnel involved in specifications, bidder prequalification, and procurement are fully aware of Nalcor's commitments towards maximizing benefits in this area and act accordingly.

RECOMMENDATION 12.10 Update quantitative targets at time of sanction

The Panel recommends that, if the Project is approved, Nalcor update at the time of Muskrat Falls sanction, the quantitative objectives or targets and the detailed list of goods and services required by the Project. Further, that this update be done in consultation with interested parties and the information be provided for Muskrat Falls construction and, to the extent possible, for the Project as a whole.

RECOMMENDATION 12.11 Transparent bidding process

The Panel recommends that, if the Project is approved, Nalcor implement a transparent bidding process that ensures that bidders are fully aware of the decision-making process, unsuccessful bidders can find out the reasons why and thereby improve, and Nalcor's commitments and programs apply and are enforced by all its contractors, sub-contractors and suppliers.

RECOMMENDATION 12.12 Modifications to the Benefits Strategy

The Panel recommends that, if the Project is approved, Nalcor and the provincial Department of Natural Resources modify two overall provisions of the Benefits Strategy. The first is to ensure that both the monthly reports on employment and goods and services and the quarterly reports on compliance are publically available and not restricted by the confidentiality provisions of Nalcor's legislation. The second is to remove the provision that allows the Minister to modify the benefits targets and other commitments regarding this Project at the Minister's sole discretion.

RECOMMENDATION 13.1 Sheshatshiu social effects mitigation

The Panel recommends that, if the Project is approved, Innu Nation, Sheshatshiu Innu Band Council, Nalcor, the provincial Department of Health and Community Services, and relevant federal government departments develop a Memorandum of Understanding with regard to identifying and implementing (a) mechanisms to prevent the exacerbation of existing social

problems and (b) mitigation measures such as mental health and addictions services and family support required to address any Project-related increases in social problems. Each party would bring to the table its relevant knowledge and resources. In the case of Innu Nation and Sheshatshiu Innu Band Council, this would include any provisions of the Impacts and Benefits Agreement component of the *Tshash Petapen* Agreement that directly address this issue. In the case of Nalcor, its role would be to adjust hiring, employment and employee assistance arrangements where possible and appropriate to assist or reinforce mitigation. The federal and provincial governments should provide resources to discharge their responsibilities in these areas.

RECOMMENDATION 13.2 Social effects needs assessment and research

The Panel recommends that, if the Project is approved, the provincial Department of Health and Community Services, in consultation with Aboriginal groups, and appropriate government and community agencies from the Upper Lake Melville area, conduct a social effects needs assessment, including an appropriately resourced participatory research component, that would determine the parameters to monitor, collect baseline data, and provide recommendations for social effects mitigation measures and an approach to on-going monitoring. It is expected that Innu Nation would be a participant in the research and that the results would inform and enhance the social effects mitigation measures suggested in Recommendation 13.1. The results of the needs assessment would be documented in a public report and, subject to the agreement of participants, the results of the research would be published in a peer-reviewed journal.

RECOMMENDATION 13.3 Worksite measures to address addictions issues

The Panel recommends that, if the Project is approved, Nalcor conduct careful monitoring of the effectiveness of the policy of controlled access to alcohol at the accommodation camps and provide professional addictions counselling to employees.

RECOMMENDATION 13.4 Variety of work schedules

The Panel recommends that, if the Project is approved, Nalcor offer a variety of work schedules, and require the same of its contractors, to accommodate different groups of workers and to assist in meeting its employment goals, particularly for Aboriginal employees and women.

RECOMMENDATION 13.5 Health and social services

The Panel recommends that, if the Project is approved, the provincial Department of Health and Community Services formally commit to provide the human resources required to address any Project-related increases in the demand for mental health, addictions and other health and social services at the Labrador Health Centre, as identified in the needs assessment. Nalcor's contribution to mitigation measures to address this should be clarified through a Memorandum of Understanding with the Labrador-Grenfell Regional Health Authority.

RECOMMENDATION 13.6 Capacity agreement with Happy Valley-Goose Bay

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador and Nalcor negotiate a capacity agreement with the Town of Happy Valley-Goose Bay to provide financial resources to increase the Town's capacity to address additional administrative demands related to the Project. The time period for the agreement would be negotiated by the parties and should relate to the needs expected at different stages of the Project. The resources would be intended to enable the Town to:

- establish baseline data on infrastructure capacity and use prior to the start of construction;
- monitor Project-related infrastructure effects throughout the construction period of the Project and identify needed mitigation;

- prepare, publicize and update on a regular basis, emergency preparedness plans to address the possibility of a catastrophic flood event;
- prepare a low income housing strategy; and
- address issues related to Project-related in-migration and the potential economic downturn at the end of the construction phase, and any other Project-related effects within the Town, not otherwise mitigated.

RECOMMENDATION 13.7 Funding for infrastructure mitigation

The Panel recommends that, prior to Project sanction, a binding and firm commitment be given by Nalcor and the Government of Newfoundland and Labrador that sufficient funds and resources be made available to fully mitigate Project-related adverse impacts on infrastructure in Happy Valley-Goose Bay.

RECOMMENDATION 13.8 Low-income housing strategy

The Panel recommends that, if the Project is approved, before construction begins, Nalcor support the efforts of the Town of Happy Valley-Goose Bay, relevant federal and provincial departments, and local low-income housing agencies, to develop and implement a strategy to set measurable targets, address the existing low-income housing needs and mitigate the adverse impacts of Project-related in-migration on low-income housing.

RECOMMENDATION 13.9 Possible requirement for consumption advisories in Goose Bay or Lake Melville.

The Panel recommends that, if the Project is approved and the outcome of the downstream mercury assessment (Recommendation 6.7) indicates that consumption advisories would be required for Goose Bay or Lake Melville, Nalcor enter into negotiations prior to impoundment with the parties representing – as appropriate – Goose Bay and Lake Melville resource users. Depending on where the consumption advisories would apply, these could include Aboriginal groups, the Town of Happy Valley-Goose Bay, Mud Lake Improvement Committee, the Town of North West River and the community of Rigolet. The purpose of the negotiations would be to reach agreement regarding further mitigation where possible and compensation measures, including financial redress if necessary. This recommendation would also apply later in the process if the downstream mercury assessment indicated that advisories were not likely, but monitoring subsequently required their application.

RECOMMENDATION 13.10 Consumption advisory implementation

The Panel recommends that, if the Project is approved and fish and seal monitoring indicates that consumption advisories are required, Nalcor:

- follow Health Canada guidelines regarding the establishment of human mercury hazard quotient levels and fish consumption advisories;
- consult with Aboriginal Affairs and Northern Development Canada regarding best practices for the communication of advisories;
- consult with Aboriginal groups and affected communities regarding an effective approach to the communication and implementation of consumption advisories that ensures that affected communities have an understanding of the quantities and types of fish that can be consumed safely and the health benefits of including fish in one's diet;
- ensure that notifications of the consumption advisories are placed at regular intervals in easily visible locations along the shorelines of affected water bodies;
- ensure that consumption advisories are updated as necessary to reflect any changes detected in mercury levels in fish or seal; and

- provide publicly accessible, up-to-date and accurate information through the internet, radio, newspapers and other means regarding the health risks of mercury and the status of the advisories.

RECOMMENDATION 13.11 Human health and mercury monitoring

The Panel recommends that, if the Project is approved, Nalcor, in collaboration with Health Canada and the provincial Department of Health and Community Services:

- consult with Aboriginal groups and affected communities regarding the approach to be taken to baseline and follow-up mercury testing and the communication of results for each group; and
- establish baseline human mercury levels in Churchill Falls, Upper Lake Melville communities and Rigolet, with consideration given to offering blood tests as well as hair samples for Innu participants, due to inconsistencies noted in the correlation between hair sample results and dietary consumption.

If consumption advisories are required, it is further recommended that Nalcor ensure that a human health mercury monitoring program is established concurrently with the issuing of consumption advisories. This monitoring would continue until five years after the lifting of consumption advisories, or until such time as determined by Health Canada, and would be overseen by the Monitoring and Community Liaison Committee described in Chapter 15.

RECOMMENDATION 13.12 Dietary surveys

The Panel recommends that, if the Project is approved and consumption advisories are required as a result of mercury levels in fish or seal, Nalcor conduct ongoing dietary surveys as an integral part of the mercury monitoring program, including fish, seal, caribou and other country food. Dietary surveys should be conducted concurrently with regular mercury testing in affected communities to determine the effectiveness of the consumption advisories and the overall impact on fish and country food consumption.

RECOMMENDATION 13.13 Research on mercury in country food

The Panel recommends that, if the Project is approved, the provincial Department of Labrador and Aboriginal Affairs, in consultation with Health Canada and Aboriginal groups, initiate a study of (a) the extent of country food contamination by mercury and other contaminants and (b) human consumption levels of country food, particularly in areas where people are also exposed to mercury in fish, to identify the potential risks to human health in Labrador.

RECOMMENDATION 14.1 Emergency preparation for the possibility of a dam failure

The Panel recommends that, if the Project is approved, Nalcor be required to:

- prepare and provide to affected communities updated maps that more clearly show areas that would be flooded following a dam failure;
- prepare, in consultation with the relevant communities and appropriate authorities, an Emergency Preparedness Plan, for response in the event of catastrophic dam failure, and emergency response procedures and community evacuation procedures related to a dam failure and subsequent flooding; the Plan should be reviewed every five years;
- work with each community that has been identified as being at risk of flooding in the event of a dam failure to develop evacuation plans, to be completed prior to filling of the reservoirs;
- work with emergency response providers and assist as appropriate in the event of an evacuation;
- implement a flood warning system for Mud Lake and Happy Valley-Goose Bay to be approved by the provincial Department of Environment and Conservation; and
- conduct seismographic monitoring in the Project area prior to construction.

RECOMMENDATION 14.2 Compensation for losses in the event of a dam failure

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador require Nalcor to assume liability on a 'no fault' basis for any loss of life and financial losses incurred because of the destruction of property and belongings and disruption of activities caused by flooding as a result of one or more dams failing on the lower Churchill River. Nalcor should provide guarantees in the form of insurance, bonds or other appropriate measures that individuals, businesses and institutions suffering damage would receive full compensation, the amount to be determined by a neutral third party, regardless of the cause of the dam failure.

RECOMMENDATION 14.3 Seismic testing

The Panel recommends that, if the Project is approved, Nalcor carry out seismic testing during reservoir filling and apply appropriate mitigation measures in the event of a seismic event related to reservoir filling.

RECOMMENDATION 15.1 Authorizing regulation

The Panel recommends that, if the Project is approved, the Government of Newfoundland and Labrador issue an authorizing regulation or equivalent mechanism that:

- lists and requires Nalcor to implement all its environmental management commitments in relation to the Project made during the course of the environmental assessment, plus the additional measures recommended by the Panel and accepted by the Government of Newfoundland and Labrador;
- lists and requires provincial departments to implement all their environmental management commitments in relation to the Project made during the course of the environmental assessment, plus the additional measures recommended by the Panel and accepted by the Government of Newfoundland and Labrador;
- includes a mechanism for updates as required to reflect any additions or changes, including adaptive management strategies that may be required and are not yet identified;
- ensures compliance with Environmental Protection Plans, Emergency Response Plans, Contingency Plans, Occupational Health and Safety Plans, and Environmental Effects Monitoring Plans including those that are implemented through another regulatory instrument and those that are unregulated;
- requires Nalcor to prepare and publish on the internet an annual report describing its environmental management activities and results, including mitigation, monitoring and adaptive management as appropriate, and related disbursements;
- establishes a monitoring and community liaison committee; and
- remains in effect for the duration of the construction period and a sufficient period of time thereafter to ensure there is no longer a risk of adverse effects as a result of the Project.

RECOMMENDATION 15.2 Federal-provincial joint regulatory plan

The Panel recommends that, if the Project is approved, the federal and provincial governments prepare a joint regulatory plan for the Project which outlines their respective regulatory requirements and includes a coordinated approach to areas where there is overlapping or related jurisdiction, and commit to it by signing a Memorandum of Agreement. The regulatory plan should address the regulations, guidelines, standards and criteria to be applied to activities. Each government would appoint a coordinating department or agency to prepare the plan and to produce a joint annual report regarding Nalcor's compliance, any issues or problems that were identified and how they were resolved. This report would be made available to the public through the internet.

RECOMMENDATION 15.3 Long-term funding for environmental management from Nalcor

The Panel recommends that, if the Project is approved, and to the extent that funds are not committed from other sources, Nalcor identify and allocate in its detailed Project budget, financial support for environmental management for the duration of Project construction. The Panel further recommends that Nalcor make a general commitment with a ten-year forecast, to be updated every five years, until such time as there is no longer evidence of ongoing environmental effects resulting from the Project.

RECOMMENDATION 15.4 Long-term funding for environmental management from government departments

The Panel recommends that, if the Project is approved, the governments of Newfoundland and Labrador and Canada make long-term commitments to support annual budget requests by the relevant departments with responsibilities for project-related environmental management including socio-economic mitigation commitments. The Panel further recommends that the governments make general commitments with a ten-year forecast, to be updated every five years, until such time as there is no longer evidence of ongoing environmental effects resulting from the Project.

RECOMMENDATION 15.5 Lower Churchill Project Monitoring and Community Liaison Committee

The Panel recommends that, if the Project is approved, prior to the start of construction, the provincial Department of Environment and Conservation appoint a Monitoring and Community Liaison Committee, using a community-based nomination process. Nalcor, through the Department, should provide the Committee with sufficient resources to allow for staff support, expenses and a modest honorarium for non-government participants, acquisition of independent expert advice, and adequate communication with community residents including occasional public forums. The mandate of the Committee would be set out in the Authorizing Regulation and the Federal-Provincial regulatory plan. The Committee would operate throughout the construction period and for the first ten years of the operating period, at which point the continuing need for the Committee should be reassessed by the Department in consultation with the Committee, the communities and Nalcor.

The Committee would:

- provide community feedback and advice to the Department and to Nalcor on relevant issues including Project-specific mitigation, impact monitoring and adaptive management committed to by Nalcor and as recommended by the Panel;
- be empowered as required to establish subcommittees or working groups to address the key areas of biophysical monitoring and follow-up, enhancing employment and business benefits, and health and social issues;
- have representation from communities, community-based agencies and non-government organizations, Aboriginal organizations, relevant federal and provincial government departments and Nalcor (ex-officio); and
- liaise with the public to ensure a transparent approach to addressing public concerns and the communication of monitoring results.

RECOMMENDATION 15.6 Project-specific effects monitoring programs

The Panel recommends that, if the Project is approved, all Project-specific effects monitoring programs, whether conducted by Nalcor, governments or in combination, include the following elements:

- identification of monitoring objectives and means of achieving verifiable results capable of guiding remedial action;

- formulation of clearly stated research questions capable of testing impact predictions;
- key measurable indicators linking Project activities to outcomes, and threshold or reference levels to identify Project effects;
- strategies and protocols for data collection and quality control;
- protocols for data compilation, storage, control and access;
- provision for data analysis and assessment; and
- reporting procedures and schedules.

RECOMMENDATION 15.7 Adaptive management

The Panel recommends that, if the Project is approved, adaptive management for Project-specific or cumulative effects, whether conducted by Nalcor, governments, or in combination, include the following components:

- commitment to a proactive approach to adaptive management;
- clearly defined impacts thresholds to clarify where and when adaptive responses would be necessary;
- implementation and contingency plans and resources to enable responsive action especially in areas where effect predictions are thought to be uncertain and where predictive errors may have serious consequences;
- transparent process for setting and adjusting monitoring and management priorities; and
- provision for regular review of adaptive management effectiveness, adjustment of related monitoring and responses to focus on significant continuing concerns.

RECOMMENDATION 15.8 Complaints resolution

The Panel recommends that, if the Project is approved, before the start of construction, Nalcor develop a complaints resolution process, in consultation with the Monitoring and Community Liaison Committee, to address concerns relating to possible adverse Project effects on individuals, and to be implemented during construction and operations. The process could include the following:

- easy access for individuals to bring concerns or complaints to Nalcor via a toll-free phone number, website and other appropriate means;
- dedicated Nalcor staff support to receive, process and respond to complaints;
- a tracking process with response time targets;
- third-party adjudication in the event that complaints cannot be otherwise resolved to the satisfaction of both Nalcor and the complainant; and
- a system to report on complaints received and how they were resolved.

RECOMMENDATION 15.9 Environmental review in the event that construction of the second generating facility is delayed

The Panel recommends that, if the Project is approved and the construction of the second generating facility and reservoir does not start before the first is completed, the environmental release would expire and terms and conditions contained in the original release would be revisited. The extent of the review required for later release would be the decision of the relevant federal and provincial governments, depending on applicable laws and circumstances at the time.

RECOMMENDATION 15.10 Local hiring for environmental management work

The Panel recommends that, if the Project is approved, where possible, Nalcor hire local people to work on environmental monitoring and mitigation projects to benefit from their local knowledge and to develop local skills and experience in the field of environmental management.

RECOMMENDATION 15.11 Government response to Panel report

The Panel recommends that the federal and provincial governments provide written responses to the Panel report and that these responses be made available to the general public through the internet.

RECOMMENDATION 15.12 Decommissioning

The Panel recommends that Nalcor demonstrate, prior to Project approval and in a manner acceptable to both governments, how it will assume financial responsibility for the potential future decommissioning of the Project to ensure that decommissioning does not become a burden to future generations.

RECOMMENDATION 16.1 Regionally integrated cumulative effects assessment

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation, in collaboration with the provincial Department of Labrador and Aboriginal Affairs and other relevant departments, identify regional mechanisms to assess and mitigate the cumulative effects of current and future development in Labrador.

RECOMMENDATION 16.2 Establishment of protected areas

The Panel recommends that, if the Project is approved, the provincial Department of Environment and Conservation commit resources to advance the Protected Areas Strategy process by working towards the following goals and reporting annually on progress:

- identify priority candidate areas for provincial protection in Labrador in order to bring the total protected area (federal and provincial) up to the national average (approximately 8.5 percent) before any additional major development is approved in Labrador;
- identify additional candidate areas in Labrador needed to bring the total protected area up to the level identified in the Protected Areas Strategy as desirable for adequate conservation purposes (10 to 15 percent);
- through this process, address preservation of representative areas of all ecozones, mitigation of habitat fragmentation, especially for migratory wildlife, and protection of selected rivers; and
- establish a schedule to ensure that priority candidate areas are protected.

APPENDIX 2 JOINT REVIEW PANEL AGREEMENT AND TERMS OF REFERENCE**AGREEMENT****Concerning**

**The Establishment of a Joint Review Panel for the Environmental Assessment of the
Lower Churchill Hydroelectric Generation Project**

between

The Government of Canada, as represented by the Minister of the Environment

and

**The Government of Newfoundland and Labrador, as represented by
the Minister of Environment and Conservation and
the Minister for Intergovernmental Affairs**

PREAMBLE

WHEREAS Newfoundland and Labrador Hydro is proposing to develop hydroelectric generating facilities with interconnecting transmission lines on the lower section of the Churchill River;

WHEREAS the Project/Undertaking, as proposed by the Proponent, is subject to an environmental assessment under the *Canadian Environmental Assessment Act* and the *Environmental Protection Act*;

WHEREAS the Governments of Canada and Newfoundland and Labrador wish to ensure that the type and quality of information and conclusions on environmental effects required to satisfy their respective legislative requirements are produced through a single, effective and efficient environmental assessment process;

WHEREAS the Minister of the Environment of Canada has responsibilities pursuant to the *Canadian Environmental Assessment Act* and has referred the environmental assessment relating to the project to a review panel in accordance with subsection 29(1) of the Act;

WHEREAS the Minister of Environment and Conservation of Newfoundland and Labrador has responsibilities pursuant to the *Environmental Protection Act* and has recommended to the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador that public hearings be held on the Project/Undertaking;

WHEREAS the Minister for Intergovernmental Affairs of Newfoundland and Labrador has responsibilities pursuant to the *Intergovernmental Affairs Act*;

WHEREAS section 72 of the *Environmental Protection Act* provides that the Minister of Environment and Conservation, with the approval of the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador, may enter into an agreement with another government regarding the environmental assessment of an undertaking;

WHEREAS section 73 of the *Environmental Protection Act* provides that the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador may establish a joint review panel in conjunction and coordination with another government where an agreement has been reached with such other government pursuant to section 72 of the Act with respect to an undertaking;

WHEREAS section 40(2) of the *Canadian Environmental Assessment Act* enables the Minister of the Environment to enter into an agreement with other jurisdictions respecting the joint establishment of a review panel and the manner in which the environmental assessment of the project is to be conducted by the review panel;

WHEREAS the Minister of the Environment has determined that a joint review panel with the Province of Newfoundland and Labrador will be the means by which Canada will proceed with the environmental assessment of the Project/Undertaking;

WHEREAS the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador has ordered public hearings and authorized the Minister of Environment and Conservation to enter into an agreement with Canada on the conduct of those hearings; and

WHEREAS the Ministers have requested the Proponent to submit an Environmental Impact Statement to the joint review panel for the purposes of informing the environmental assessment process.

THEREFORE, the Minister of the Environment and the Minister of Environment and Conservation hereby establish a joint review panel for the environmental assessment of the Project/Undertaking in accordance with the conditions of this agreement and the Terms of Reference attached as Schedule 1.

1.0 Definitions

For the purpose of this Agreement, including the recitals and Schedule 1:

"Agency" means the Canadian Environmental Assessment Agency;

"Agreement" means this Agreement including Schedule 1;

"CEAA" means the *Canadian Environmental Assessment Act*;

"Day" means a calendar day;

"Department" means the Newfoundland and Labrador Department of Environment and Conservation;

"EIS Guidelines" mean the direction provided to the Proponent by Canada and Newfoundland and Labrador, which must be addressed in the Proponent's Environmental Impact Statement;

"Environment" means the components of the Earth, and includes:

- (i) land, water and air and all layers of the atmosphere,
- (ii) all organic and inorganic matter and living organisms as well as plant, animal and human life,

- (iii) the social, economic, recreational, cultural and aesthetic conditions and factors that influence the life of humans or a community,
- (iv) a building, structure, machine or other device or thing made by humans,
- (v) a solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of humans, or
- (vi) the interacting natural systems, a part or a combination of those things referred to in subparagraphs (i) to (v) and the interrelationships between 2 or more of them;

"Environmental Assessment" ("EA") means an assessment of the Environmental Effects of the Project/Undertaking that is conducted in accordance with the Legislation;

"Environmental Effect" means:

- (a) any change that the Project/Undertaking may cause in the Environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act;
 - (b) any effect of any change referred to in paragraph (a) on:
 - (i) health and socio-economic conditions;
 - (ii) physical and cultural heritage;
 - (iii) the current use of lands and resources for traditional purposes by aboriginal persons; or,
 - (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; or,
 - (c) any change to the Project/Undertaking that may be caused by the Environment;
- whether any such change or effect occurs within or outside Canada.

For the purposes of this Agreement, "cultural heritage" includes but is not limited to a human work or a place that

- (a) either:
 - (i) gives evidence of human activity;
 - (ii) has spiritual and/or cultural meaning; or
 - (iii) gives evidence of human activity and has spiritual and/or cultural meaning; and
- (b) that has heritage value.

"Environmental Impact Statement" (hereinafter "EIS") means the environmental assessment report that is prepared by the Proponent;

"EPA" means the Newfoundland and Labrador *Environmental Protection Act*;

"Follow-up Program" means a program for

- (a) verifying the accuracy of the EA of the Project/Undertaking; and,

- (b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project/Undertaking;

"Legislation" means, collectively, the CEAA and the EPA;

"Ministers" means the federal Minister of the Environment and the provincial Minister of Environment and Conservation;

"Panel" means the joint review panel, which is appointed pursuant to Section 2 of this Agreement;

"Participant Funding Program" means the program referred to in Section 8.0 of this Agreement;

"Parties" means the signatories to this Agreement;

"Project/Undertaking" means the Lower Churchill Hydroelectric Generation Project as described in Scope of the Project/Undertaking in Part 1 of the attached Schedule.

"Proponent" means Newfoundland and Labrador Hydro;

"Public Registry" means a repository to facilitate public access to the records relating to the EA of the Project/Undertaking in accordance with section 55 of the CEAA, that has been established by Fisheries and Oceans Canada and Transport Canada and that will be maintained by the Agency or the Secretariat until submission of the Panel report to the Ministers;

"Secretariat" means the Secretariat referred to in Section 5.0 of this Agreement;

"Terms of Reference" means the Terms of Reference for the Panel, as set out in Schedule 1 of this Agreement;

2.0 Establishment of the Panel

2.1 A process is hereby established for the creation of a Panel, pursuant to sections 40, 41 and 42 of the CEAA and section 73 of the EPA and, for the purposes of the review of the Project/Undertaking.

2.2 The Agency and the Department will make arrangements for the coordination of public announcements respecting the establishment of the Panel.

3.0 Constitution of the Panel

3.1 The Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador shall jointly establish the Panel

3.2. The Panel shall consist of five members.

3.3 The Agency and the Department will jointly compile a list of recommended Panel members and will provide that list to the Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador for their consideration in establishing the Panel.

3.4 The Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador shall appoint Panel members from the joint list, consistent with the requirements of the CEAA and the EPA.

3.5 The Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador shall each appoint one member of the Panel and shall jointly appoint the remaining members.

3.6 The Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador shall jointly appoint the chair or co-chairs of the Panel, who shall not be a resident of the geographical area of the Project/Undertaking

3.7 Panel members shall be unbiased and free from any conflict of interest relative to the Project/Undertaking and have knowledge or experience relevant to the anticipated effects of the Project/Undertaking on the environment.

3.8 Panel members will not be employed by the Public Service of Newfoundland and Labrador or of Canada.

3.9 At least two (2) of the Panel members shall be residents of the geographical area of the Project/Undertaking.

3.10 In the event that a Panel member resigns or is unable to continue to work, the remaining members shall constitute the Panel unless the Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador determine otherwise. In such circumstances, the Minister of the Environment and the Lieutenant-Governor in Council of the Province of Newfoundland and Labrador may choose to replace the Panel member.

4.0 Conduct of the Environmental Assessment by the Panel

4.1 The Panel shall have all the powers and duties of a panel set out in section 35 of the CEAA and sections 64 and 65 of the EPA and applicable regulations.

4.2 The Panel shall conduct the EA in a manner that discharges the requirements set out in the CEAA, the EPA and in the Terms of Reference for the Panel set out in Schedule 1.

4.3 All Panel hearings shall be public and shall provide for the participation of Aboriginal groups, the public, governments, the Proponent and other interested parties.

4.4 A majority of the Panel members constitutes a quorum for the purposes of the EA to be conducted by the Panel. When a hearing, public meeting, or other activity is conducted by the Panel and a member of the Panel for any reason does not attend on any day or part of a day, the other member or members who are sitting at the hearing, public meeting or other activity, if they constitute a quorum, may continue as fully and effectively as though the absent member or members were present.

5.0 Secretariat and Administrative Matters

5.1 Administrative, technical and procedural support for the Panel shall be provided by a Secretariat jointly established by the Agency and the Department.

5.2 The Secretariat shall report to the Panel and shall be structured and operated so as to allow the Panel to conduct the EA in an efficient and cost effective manner.

5.3 Prior to the appointment of the Panel, the Agency and the Department shall prepare a budget estimate for the activities of the Panel. The budget as agreed to by the Agency and the Department shall be finalized following the appointment of the Panel.

5.4 Costs associated with the review by the Panel will be apportioned between the Agency and the Department in accordance with a cost-sharing agreement to be finalized prior to the appointment of the Panel.

6.0 Record of Environmental Assessment and Panel Report

6.1 A Project File containing all records produced, collected or submitted with respect to the EA of the Project/Undertaking shall be maintained by the Agency from the appointment of the Panel until the report of the Panel is submitted to the Ministers. The Public Registry shall be operated in a manner to ensure convenient public access to the records for the purposes of compliance with section 55 of the CEAA and the practices of the Department.

6.2 On completion of the EA of the Project/Undertaking, the Panel shall prepare a report and submit it to the Ministers who will make it public.

6.3 The report will address the factors required to be considered under section 16 of the CEAA and section 65 of the EPA, will set out the rationale, conclusions and recommendations of the Panel relating to the EA of the Project/Undertaking, including any mitigation measures and follow-up program, and include a summary of issues raised by Aboriginal groups, the public, governments and other interested parties.

6.4 The Parties agree to coordinate, to the extent possible, the timing and announcements of decisions on the Project/Undertaking.

6.5 Once the report is submitted to the Minister of the Environment, responsibility for the maintenance of the Public Registry in accordance with section 55 of the CEAA will be transferred to Fisheries and Oceans Canada as responsible authority.

7.0 Other Government Departments or Agencies

7.1 At the request of the Panel, federal and provincial departments or agencies having specialized knowledge with respect to the Project/Undertaking shall provide available information and knowledge in a manner acceptable to the Panel.

7.2 Subject to clause 7.1 of this Agreement and subsection 12(3) of the CEAA, nothing in this agreement shall restrict the participation by way of submission to the Panel of federal or provincial departments or agencies.

8.0 Participant Funding

8.1 The Agency will administer a participant funding program to facilitate the participation of Aboriginal groups and the public in the EA of the Project/Undertaking.

9.0 Review, Interpretation and Amendment of this Agreement

9.1 The Parties will review this Agreement at the request of either Party.

9.2 The Parties will make every reasonable effort to agree on the interpretation and application of this Agreement.

9.3 To the extent practicable, the Parties will seek to resolve differences of opinion in the interpretation and application of this Agreement at a working level, through good faith reasonable efforts.

9.4 The Agreement may only be amended with the written consent of both Parties. Unless another day is agreed, an amendment will become effective upon its execution by the last of the Parties.

In witness whereof our signatures are hereunto inscribed on this ____ day of ____ 2008.

[Original signed by:]

The Honourable Jim Prentice
Minister of the Environment – Government of Canada
Date:

The Honourable Clyde Jackman
Minister of Environment and Conservation (Acting) – Government of Newfoundland and Labrador
Date:

The Honourable Dave Denine
Minister for Intergovernmental Affairs – Government of Newfoundland and Labrador
Date:

Schedule 1 - Terms of Reference for the Panel

Introduction

Pursuant to the Agreement Concerning the Establishment of a Joint Review Panel for the Environmental Assessment of the Lower Churchill Hydroelectric Generation Project, a Panel is appointed to conduct an EA of the Project/Undertaking proposed by Newfoundland and Labrador Hydro.

The Panel shall conduct the EA of the Project/Undertaking in accordance with these Terms of Reference and consistent with the Agreement between Canada and Newfoundland and Labrador on the Establishment of a Joint Review Panel for the Environmental Assessment of the Lower Churchill Hydroelectric Generation Project.

In performing its responsibilities, the Panel shall promote and facilitate public participation and ensure that the process takes into account the concerns and traditional knowledge of Aboriginal persons or groups and the concerns and community knowledge of the public.

Part I – Scope of the Project/Undertaking

The Proponent proposes a project/undertaking consisting of hydroelectric generating facilities at Gull Island and Muskrat Falls, and interconnecting transmission lines to the existing Labrador grid. The Project/Undertaking includes the following components as described by the Proponent¹. The specific dimensions/characteristics of the proposal are subject to change as a result of the findings of the environmental assessment.

The Gull Island facility consisting of a generating station with a capacity of approximately 2,000 MW that includes:

- A dam 99 m high and 1,315 m long; and
- A 215 km² reservoir in area at an assumed full supply level of 125 m above sea level (asl).

The dam is to be a concrete faced, rock fill dam. The reservoir is to be 230 km long, and the area of inundated land is to be in the order of 85 km² at full supply level. The powerhouse is to contain five Francis turbines.

The Muskrat Falls facility consisting of a generating station with a capacity of approximately 800 MW that includes:

- A concrete dam with two sections on the north and south banks of the river, and
- A 100 km² reservoir in area at an assumed full supply level of 39 m asl.

The north and south dams will be constructed or roller compacted concrete. The north section dam is to be in the order of 32 m high and 432 m long, while the south section is to be in the order of 29 m high and 125 m long. The reservoir is to be 60 km long and the area of inundated land is to be in the order of 41 km² at full supply level. The powerhouse is to contain four propeller or Kaplan turbines, or a combination of both.

Interconnecting transmission lines consisting of:

- A 735 kV transmission line between Gull Island and Churchill Falls; and,
- Two 230 kV transmission lines between Muskrat Falls and Gull Island.

The 735 kV transmission line is to be 203 km long and the 230 kV transmission lines are to be 60 km long. Both lines will be lattice-type steel structures. The location of the transmission lines is to be north of the Churchill River; the final route is the subject of a route selection study that will be combined on double-circuit structures.

¹ All measures are approximate

Part II – Scope of the Environmental Assessment

The Panel shall consider the following factors in the EA of the Project/Undertaking as outlined in Sections 16(1) and 16(2) of the CEEA and Sections 57 and 69 of the EPA:

1. Purpose of the Project/Undertaking;
2. Need for the Project/Undertaking;
3. Rationale for the Project/Undertaking;
4. Alternative means of carrying out the Project/Undertaking that are technically and economically feasible and the environmental effects of any such alternative means;
5. Alternatives to the Project/Undertaking;
6. Extent to which biological diversity is affected by the Project/Undertaking;
7. Description of the present environment which may reasonably be expected to be affected, directly or indirectly, by the Project/Undertaking, including adequate baseline characterisation;
8. Description of the likely future condition of the environment within the expected life span of the Project/Undertaking if the Project/Undertaking was not approved;
9. Environmental Effects of the Project/Undertaking, including the Environmental Effects of malfunctions, accidents or unplanned events that may occur in connection with the Project/Undertaking;
10. Any cumulative Environmental Effects that are likely to result from the Project/Undertaking in combination with other projects or activities that have been or will be carried out;
11. The significance of the Environmental Effects as described in items 9 and 10;
12. Mitigation measures that are technically and economically feasible and that would mitigate any significant adverse Environmental Effects of the Project/Undertaking, including the interaction of these measures with existing management plans;
13. Proposals for environmental compliance monitoring;
14. Measures to enhance any beneficial Environmental Effects;
15. Need for and requirements of any follow-up program in respect of the Project/Undertaking;
16. Capacity of renewable resources that are likely to be significantly affected by the Project/Undertaking to meet the needs of the present and those of the future;
17. Extent of application of the precautionary principle to the Project/Undertaking; and
18. Comments received from Aboriginal persons or groups, the public and interested parties by the Panel during the EA;
19. Factors related to climate change including greenhouse gas emissions;
20. Proposed public information program.

To assist in the analysis and consideration of these issues, in addition to the Secretariat established by Canada and Newfoundland and Labrador to support the Panel, the Panel may retain, within its approved budget, independent expertise to provide information on and help interpret technical and scientific issues and matters related to traditional knowledge and community knowledge.

Aboriginal Rights Considerations

The Panel will have the mandate to invite information from Aboriginal persons or groups related to the nature and scope of potential or established Aboriginal rights or title in the area of the Project, as well as information on the potential adverse impacts or potential infringement that the Project/Undertaking will have on asserted or established Aboriginal rights or title.

The Panel shall include in its Report:

1. information provided by Aboriginal persons or groups related to traditional uses and strength of claim as it relates to the potential environmental effects of the project on recognized and asserted Aboriginal rights and title.
2. any concerns raised by Aboriginal persons or groups related to potential impacts on asserted or established Aboriginal rights or title.

The Panel will not have a mandate to make any determinations or interpretations of:

- the validity or the strength of any Aboriginal group's claim to aboriginal rights and title or treaty rights;
- the scope or nature of the Crown's duty to consult Aboriginal persons or groups;
- whether Canada or Newfoundland and Labrador has met its respective duty to consult and accommodate in respect of potential rights recognized and affirmed by s. 35 of the *Constitution Act, 1982*; and
- The scope, nature or meaning of the Labrador Inuit Land Claims Agreement.

Part III - Steps in the Environmental Assessment Process

The main steps in the EA by the Panel will be as follows:

1. Site Visit:

The Panel will visit the proposed Project area to gain a first-hand understanding of the Project/Undertaking and its surroundings.

2. Public Information Centres

Public information centres will be established by the Panel in Happy Valley – Goose Bay, Sheshatshiu, Natuashish, and other locations in the Province as deemed appropriate by the Panel. These public information centres will be administered by the Secretariat.

3. Submission of the EIS

The Proponent shall submit to the Panel the EIS prepared in accordance with the EIS Guidelines issued by the Ministers. The Panel shall direct the Proponent to distribute the EIS to Aboriginal groups, the public, governments and other interested parties.

4. Review of the EIS:

Within 7 days of receiving the EIS from the Proponent, the Panel shall initiate a 75-day public comment period on the EIS. Aboriginal groups, the public, governments and other interested parties will be able to review the EIS and provide comments to the Panel on whether it adequately addresses the EIS Guidelines and whether additional information should be provided before public hearings are convened. The Panel also has the independent authority to request additional information from the Proponent. The comments are to be provided either in writing or verbally by submitting quality recordings. Comments given verbally are to be considered as fully as written comments.

5. Comments provided to the Proponent

Comments received by the Panel during the public comment period, shall be provided to the Proponent. The Proponent shall provide its response to the comments not later than 60 days following completion of the public comment period.

6. EIS Sufficiency

The Panel shall review all comments received from Aboriginal groups, the public, governments and other interested parties. Should deficiencies be identified as a result of the review of the EIS, and in consideration of any comments received from Aboriginal groups, the public, governments and other interested parties and of the Proponent's response to those comments, clarification, explanation or additional technical analyses may be required from the Proponent by the Panel. The Panel will determine the need for an additional 30-day public comment period on any supplemental information provided by the Proponent in response to deficiencies identified by the Panel. Any request for additional information shall be issued by the Panel within 30 days following the close of the public comment period [or 60 days following receipt of written comments from the Proponent, whichever occurs later.] The Panel will determine the need, timing and location of any meetings required for the clarification of additional and/or technical information. Once the Panel is satisfied that all the relevant information is available, it will make a determination on the sufficiency of the EIS for the purpose of proceeding to public hearings.

7. Scheduling of Public Hearings

The Panel shall schedule and announce the start of the public hearings once it is satisfied that it has adequate information to proceed to public hearings. A minimum of 45 days notice will be provided to Aboriginal groups, the public, governments and other interested parties prior to the start of the public hearings. The Panel will schedule the public hearings to encourage the attendance and participation of Aboriginal groups and the public.

As required, the Panel will hold technical hearings on specific aspects of the Project/Undertaking in addition to community-based hearings focused on seeking the views of Aboriginal persons or groups and the public on the potential Environmental Effects of the Project/Undertaking.

8. Location of Public Hearings

The Panel will hold public hearings in locations determined by the Panel within the area likely to be affected by the Project/Undertaking, or in any area reasonably close to where the Project/Undertaking is proposed to be carried out, to provide convenient access for potentially affected Aboriginal persons or groups and the public.

9. Conduct of Public Hearings

The Panel will establish rules of procedure for public hearings and will conduct the public hearings in a manner which will:

- promote and facilitate the participation of Aboriginal persons or groups, the public and interested parties in the project area,
- afford those Aboriginal persons or groups, the public and interested parties an opportunity to present their views on the potential Environmental Effects of the Project/Undertaking; and
- ensure a thorough examination of matters relevant to its mandate.

The Panel will determine how to engage the Proponent in the public hearings. The Panel will also determine interpretation requirements for the public hearings and any other activities associated with the EA.

10. Length of Public Hearings

The public hearings will be completed within 45 days from the start of the hearings.

11. Delivery of Panel Report

The Panel will deliver its report to Ministers within 90 days following the close of the public hearings. The report will take into account and reflect the views of all Panel members. The report will include:

- a description of the EA process, including public hearings
- the rationale, conclusions and recommendations of the Panel with respect to the nature and significance of the potential Environmental Effects of the Project/Undertaking,
- the Panel's recommendations concerning, as appropriate, any mitigation measures including, as pertinent, recommendations concerning the environmental management of the Project/Undertaking and follow-up programs
- a summary of any issues identified and comments and recommendations received from Aboriginal persons or groups, and
- a summary of the issues raised and any comments and recommendations received from the public, governments and interested parties.

Translation and Interpretation

The translation of documents in any language other than English shall be for convenience only. The English version of each document is authoritative. In the case of any inconsistency between the English document and a translated version, the English version will prevail.

Panel's Documents

The Panel's operational procedures, public notices pertaining to the Panel's meetings and hearings, detailed procedures for the conduct of the public hearings, and any information request or deficiency statement issued by the Panel will be translated into French, Innu-aimun, as well as other aboriginal language(s) that the Panel deems necessary to enable open and effective participation in the process by Aboriginal persons and groups. Reasonable measures will be taken to ensure that the translations will be made available, in written and/or audiovisual forms, on the Public Registry and at Public Information Centres in a timely manner following the public release of the English version by the Panel, and will be provided on request to individuals and groups.

The Executive Summary and Recommendations of the Panel report will be translated into French, Innu-aimun, as well as other aboriginal language(s) that the Panel deems necessary to convey its key findings and recommendations to Aboriginal persons and groups that have participated in the review process prior to public release of the Panel report. Such translations in written and/or audiovisual forms will be available on the Public Registry and at Public Information Centres at the same time as the English version of the Panel report to the public.

The Panel report will be translated in French and made available in a timely manner following Panel submission of the English version of the report. Translation of the remainder of the Panel report into aboriginal language(s) will be undertaken by the Governments and made available in a timely manner upon request from Aboriginal persons or groups or the public.

Proponent's Documents:

The Panel shall consult with the participating Aboriginal groups and the Proponent regarding which parts of the EIS and any other documentation or additional information prepared by the Proponent for the Panel for use during the Environmental Assessment of the Project/Undertaking will be translated into aboriginal language(s). As determined by the Panel, the Proponent shall translate those documents and shall ensure that all reasonable measures are taken to effect translations in a timely manner.

Translations of the parts of the EIS and other Proponent documents into aboriginal language(s) as determined in the manner outlined above shall be made available in written and/or audiovisual forms, on the Public Registry and at Public Information Centres

Interpretation:

The Panel shall consult with participating Aboriginal groups prior to making a determination of interpretation requirements from English to aboriginal language(s) and from aboriginal language(s) into English for any public meetings hosted by the Panel and the public hearings, including the technical and community hearings, and any other interpretation requirements, and appropriate interpretation services will be provided by the Panel.

Amendment to the Agreement Concerning the Establishment of a Joint Review Panel for the Environmental Assessment of the Lower Churchill Hydroelectric Generation Project

between

The Government of Canada, as represented by the Minister of the Environment

and

**The Government of Newfoundland and Labrador, as represented by
the Minister of Environment and Conservation and
the Minister for Intergovernmental Affairs**

The agreement concerning the establishment of a Joint Review Panel for the environmental assessment of the Lower Churchill Hydroelectric Generation Project (the Agreement) shall be amended pursuant to clause 9.4 of the Agreement. The amendment extends the 75-day period for public comment on the Environmental Impact Statement (EIS) for an additional 30 days to three Aboriginal groups in Labrador – the Innu Nation, the Nunatsiavut Government and the Labrador Metis Nation.

Clause 4.1 of Part 3 of Schedule 1 to the Agreement is added and reads as follows:

4.1 Notwithstanding clause 4, the Innu Nation, the Nunatsiavut Government and the Labrador Metis Nation shall have an additional thirty (30) days beyond the seventy-five (75) day comment period to provide comments to the Panel on the environmental impact statement.

[Original signed by:]

The Honourable Jim Prentice
Minister of the Environment – Government of Canada
Date: 15 May 2009

The Honourable Clyde Jackman
Minister of Environment and Conservation (Acting) – Government of Newfoundland and Labrador
Date: 8 May 2009

The Honourable Dave Denine
Minister for Intergovernmental Affairs – Government of Newfoundland and Labrador
Date: 8 May 2009

Amendment to the Agreement Concerning the Establishment of a Joint Review Panel for the Environmental Assessment of the Lower Churchill Hydroelectric Generation Project

between

The Government of Canada, as represented by the Minister of the Environment

and

**The Government of Newfoundland and Labrador, as represented by
the Minister of Environment and Conservation and
the Minister for Intergovernmental Affairs**

The agreement to establish a Joint Review Panel for environmental assessment of the Lower Churchill Hydroelectric Generation Project (the Agreement) shall be amended pursuant to section 9.4 of the Agreement.

The first paragraph under the heading of *Translation and Interpretation*, Panel's Documents at Schedule 1 to the Agreement is hereby amended to read as follows:

The Panel's operational procedures, public notices pertaining to the Panel's meetings and hearings, and detailed procedures for the conduct of the public hearings will be translated into French and those aboriginal languages that the Panel deems necessary to enable open and effective participation in the process by aboriginal peoples and groups. In addition, the Panel's information requests and deficiency statements will be translated into French. With respect to aboriginal languages, the Panel will determine the extent and form of translation to be applied to its information requests and deficiency statements, including consideration of the use of summaries where appropriate. Reasonable measures will be taken to ensure that the translations will be made available, in written and/or audiovisual forms, on the Public Registry and at Public Information Centres in a timely manner following the public release of the English version by the Panel, and will be provided on request to individuals and groups.

[Original signed by:]

The Honourable Jim Prentice
Minister of the Environment – Government of Canada
Date: June 9, 2010

The Honourable Charlene Johnson
Minister of Environment and Conservation – Government of Newfoundland and Labrador
Date: April 27, 2010

The Honourable Dave Denine
Minister for Intergovernmental Affairs – Government of Newfoundland and Labrador
Date: May 3, 2010

APPENDIX 3 PANEL MEMBERS BIOGRAPHIES

Lesley Griffiths (Panel Co-Chair)

Lesley Griffiths is Co-principal of Griffiths Muecke, a consulting firm that provides services in the areas of consultation and consensus-building processes, environmental impact assessment, resource management and community development.

Ms. Griffiths has developed and implemented information and consultation strategies for community and social planning, community economic development, resource developments and various types of waste management planning.

Ms. Griffiths has substantive experience chairing environmental assessment panels in Atlantic Canada. She chaired the federal-provincial joint review panel examining the Sydney Tar Ponds remediation in Cape Breton as well as the joint review panel established for the Voisey's Bay Mine and Mill project in northern Labrador. She also served as a joint panel member for the review of the Halifax Harbour wastewater treatment facility. Ms. Griffiths co-chaired the Nova Scotia Minister of Environment and Labour's Task Force on Clean Air, producing the Province's first air quality management strategy. Until recently, she was Process Lead for the Fundy Tidal Energy Strategic environmental assessment.

Herbert Clarke (Panel Co-Chair)

Herbert Clarke was a member of the Canada-Newfoundland Offshore Petroleum Board until July 2008. He has held several senior deputy minister positions in the Government of Newfoundland and Labrador, including Deputy Minister of the Executive Council and Secretary to Cabinet, and senior executive positions in industry for the Voisey's Bay Nickel Company and Fishery Products International. He was also founding Chairman of the Fisheries Resource Conservation Council and the Association of Seafood Producers.

Mr. Clarke has experience as chair on various boards and was Public Review Commissioner for the White Rose Development Application. From 1996 to 2000, he was Vice-President Corporate Affairs at Voisey's Bay Nickel Company with primary responsibility for aboriginal affairs and for Impacts and Benefits Agreements. Mr. Clarke is retired and holds a private consulting and investment company. He is currently a Board Member of Export Development Canada.

Dr. Meinhard Doelle (Panel Member)

Meinhard Doelle is Associate Professor specialized in environmental law at the Dalhousie Law School. He is the Associate Director of the Marine and Environmental Law Institute and the Director of the Marine and Environmental Law Programme. From 1996 to 2001, he was the Executive Director of Clean Nova Scotia. He has been involved in the practice of environmental law in Nova Scotia since 1990 and in that capacity served as drafter of the Nova Scotia *Environment Act*. He is currently environmental Counsel to the Atlantic Canada law firm of Stewart McKelvey. From 2000 to 2006, he was a non-governmental member of the Canadian delegation to the United Nation climate change negotiations. From January to May 2008, he was a visiting scholar at the Environmental Law Center of the IUCN in Bonn, Germany.

Dr. Doelle has written on a variety of environmental law topics, including climate change, energy law, invasive species, environmental assessments and public participation in environmental decision making.

Catherine Jong (Panel Member)

Catherine Jong is the principal of CMJ Consulting, and has provided consulting services to the health care and education sectors in Labrador for the past fifteen years. She is based in Happy Valley-Goose Bay.

Ms. Jong has worked extensively with Aboriginal groups as well as public and private sector organizations in Labrador. She has conducted education and business needs assessments, evaluated strategies and developed educational programs to assist communities. Ms. Jong has researched and managed healthcare and social services projects and is familiar with resource development projects in the region. She was a member of the environmental assessment panel reviewing the Trans Labrador Highway Phase III Project.

James Igloliorte (Panel Member)

James Igloliorte was appointed as a lay magistrate in 1980, and then a year later became a Provincial Court Judge. He retired from the Provincial Court of Newfoundland and Labrador in 2004. In 2009 he was awarded a National Achievement Award in the field of law.

Mr. Igloliorte graduated from Memorial University with a bachelor's degree in science and education in 1974. In 1985 he received his bachelor of law degree from Dalhousie University in Halifax and returned to take up duties in Happy Valley-Goose Bay. He received an honorary doctor of laws degree from Memorial University at the 2002 spring convocation.

APPENDIX 4 DETAILED PUBLIC HEARING SCHEDULE

Date	Location	Time	Submission Deadline
March 3 General Session	Hotel North Two 382 Hamilton River Rd. Happy Valley-Goose Bay	7pm-10pm	February 21
March 4 General Session	Same as above	1pm-5pm 7pm-10pm	February 21
March 5 General Session	Same as above	9am-12pm 1pm-5pm	February 21
March 7, 8 Topic-Specific Session Need, purpose and alternatives	Same as above	9am-12pm 1pm-5pm	February 25
March 9 Topic-Specific Session Economic Impacts	Same as above	9am-12pm 1pm-5pm	February 25
March 10 Topic-Specific Session Reservoir preparation	Same as above	9am-12pm 1pm-5pm 7pm-10pm	February 25
March 11 Topic-Specific Session Reservoir preparation	Same as above	9am-12pm	February 25
March 15, 16 Topic-Specific Session Aquatic Environment	Same as above	9am-12pm 1pm-5pm	March 5 (revised)
March 17, 18 Topic-Specific Session Terrestrial Environment	Same as above	9am-12pm 1pm-5pm	March 5 (revised)
March 19 Community Session	Community Hall Mud Lake	10am-4pm	No deadline
March 21 Community Session	Northwest River Community Centre Northwest River	7pm-10pm	No deadline
March 22, 23 Community Session	Mamu Tshishkutamashutau Innu School, Sheshatshiu	1pm-5pm 7pm-10pm	No deadline
March 24 Community Session	Jens Haven Memorial School Nain (by videoconference)	7pm-10pm	No deadline
March 29 Topic-Specific Session Social & Cultural Impacts	Hotel North Two 382 Hamilton River Rd Happy Valley-Goose Bay	9am-12pm 1pm-5pm	March 19
March 30 Topic-Specific Session Environmental Management, Monitoring and Follow-up	Same as above	9am-12pm 1pm-5pm	March 19
March 30 Community Session	Northern Lights Academy Rigolet (by videoconference)	7pm-10pm	No deadline
March 31 Topic-Specific Session Cross-cutting Issues	Hotel North Two 382 Hamilton River Rd. Happy Valley-Goose Bay	9am-12pm 1pm-5pm	March 19

Date	Location	Time	Submission Deadline
March 31 Community Session	Henry Gordon Academy Cartwright (by videoconference)	7pm-10pm	No deadline
April 1 General Session	Hotel North Two 382 Hamilton River Rd. Happy Valley-Goose Bay	9am-12pm 1pm-5pm	March 22
April 2 Community Session	Same as above	9am-12pm 1pm-4pm	No deadline
April 4 General Session	Holiday Inn St. John's 180 Portugal Cove Rd., St. John's	7pm-10pm	March 22
April 5 General Session	Same as above	1pm-5pm 7pm-10pm	March 22
April 6 Community Session	Carrefour La Baie 391 Brochu St., Sept-Iles (Quebec Aboriginal communities)	7pm-10pm	No deadline
April 7, 8 Community Session	Same as above	9am-12pm 1pm-5pm 7pm-10pm	No deadline
April 13 Additional Hearing Session	Hotel North Two 382 Hamilton River Rd. Happy Valley-Goose Bay	8:30am- 12:30pm	Not applicable
April 14, 15 Closing Remarks	Same as above	9am-12pm 1pm-5pm	April 15

APPENDIX 5 SUMMARIES OF COMMUNITY HEARING SESSIONS

Mud Lake Community Hearing – March 19, 2011

The community is located southeast of Happy Valley-Goose near the mouth of the Churchill River on a channel that connects Mud Lake to the Churchill River near its mouth. The community is accessible only by boat in the summer and fall and by snowmobile in the winter and spring. The population is approximately 60 persons. The Panel heard presentations from eight community members while in Mud Lake.

Concerns

Participants in Mud Lake stated several concerns with Nalcor's assessment. In particular, one participant was concerned that the assessment relied heavily on models and lab work and that more consultation with local community members was required to validate them. Other participants disagreed that hydroelectric facilities were a form of "green energy". One participant noted that the creation of more electricity would encourage increased energy use and would be counterproductive. One resident also stated that Labrador would not benefit and that Newfoundland would receive the majority of the benefits from the destruction of a Labrador river.

Impacts on Mud Lake

Many participants discussed the impact of the Project on community travel. Concerns were related to the changes in water temperatures resulting in changes in ice dynamics. One participant worried that the Project, compounded with climate change, would result in a major delay in the timing of ice formation. Residents explained that if ice dynamics were to change, navigation across the river would be more challenging and the unsafe period for crossing would be extended. Navigation was also a concern because the river channel would change, resulting in changes in the location of sandbars. Participants expressed concerns that if navigation becomes impossible as a result of the Project and a road to Mud Lake is built, community life would change.

Participants also raised concerns about salt water intrusion and the effect of salt water on parts of the freshwater ecosystem such as vegetation, herpetiles and fish. Other participants expressed general concerns regarding the loss of fish, animals and the environment. A participant told the Panel that cultural heritage, such as archaeological sites, trapping grounds and gravesites, would be lost as a result of the Project.

Several participants raised concerns regarding dam failure. They were concerned about the responsibility for evacuating Mud Lake and how compensation for damages would be handled.

Other Impacts

One participant stated that the Project would have an effect on fish migration and spawning. Two other participants expressed concerns regarding mercury levels in fish and wondered if they would be able to consume fish after the Project was complete.

Participants mentioned other environmental concerns with the Project. A participant noted that remaining timber in the reservoir would produce methane gas which would be harmful to the ozone. Another participant worried about a leak of polychlorinated biphenyls into the river from the Project. Many participants stated that the river would not remain the same with the Project. One participant referenced that it would be comprised of artificial lakes. Another participant

expressed concerns that the river would not maintain its natural flushing abilities, which would be necessary to clear sewage flowing in the river from Happy Valley-Goose Bay.

The Panel heard concerns regarding the boom and bust effect on the local economy and impacts on local jobs in Happy Valley-Goose Bay. One participant stated that the jobs would be too short term to offer a benefit to the community. Other participants stated uncertainty surrounding hiring practices and wondered if they would avail of jobs or if they were required to be part of a union. A participant expressed concerns that local housing prices would rise and the Town of Happy Valley-Goose Bay would have to expand. Concerns were also expressed about the fact that the Project would be funded by tax dollars and that, as a result, hydro bills would rise.

Benefits

Participants stated that the jobs would be a benefit of the Project, however, most stated that they would be too short term to outweigh the costs. One participant in particular hoped that young people in Mud Lake could avail of jobs with the Project and that they would not be forced to leave the community to find work after graduation. One participant also stated that she would be more supportive of the Project if Labrador as a whole received benefits, such as power to the coasts or lower power rates.

North West River Community Hearing – March 21, 2011

The community is located approximately 40 kilometres northeast of Happy Valley-Goose Bay. The community is accessible by road year-round. As of 2006, the population of North West River was 492, approximately 45 percent of which were Inuit and 20 percent were Inuit-Métis. English is their main language. The Panel heard presentations from 10 community members while in North West River, including presentations from eight community members, one organization and the Town of North West River.

Concerns

One participant stated that the hearings were not conducive to obtaining information from community members because they did not feel comfortable speaking in a formal setting. Other participants noted that meaningful consultation with the Inuit had not occurred and that even though the town is not considered an Aboriginal community, they would still like to be consulted. One member stated that rights of people in the community should be considered before the benefit of jobs.

In addition, a participant noted that the Town of North West River did not prosper as expected after the bridge was built and the community was now suffering as a result. One community member also noted concerns about the boundary that Nalcor used to study the environmental effects.

Impacts on North West River

Several participants were concerned with methylmercury in the food chain and how it would affect their ability to eat fish. Some participants requested that additional investigations be conducted on food sources, especially seals.

Participants including community members and a representative of the Sivunivut Inuit Community Corporation shared experiences from the development of Churchill Falls regarding increased salt levels in Grand Lake and the occurrence of salt water intrusions into their wells.

These participants expressed concerns the Project would cause similar problems. A participant recommended that water in Grand Lake be pushed back to return to freshwater.

A participant questioned how the Project would benefit the community and observed that communities such as North West River were vulnerable and there would be impacts on social and health services due to the increases in people, money, alcohol, and drugs. It was also noted that additional support was required to deal with any increases in marital and family problems. Another participant expressed concerns regarding boom and bust caused by the Project and stated that it could result in a change in community composition. Participants also raised concerns about the socio-economic impacts on traditional land and resource use, employment, communities and cultural impacts.

Other Impacts

Participants were concerned with how the Project would impact the land, environment, fish and people. In particular, the Sivunivut Inuit Community Corporation and another participant stated that medicinal plants would be lost and questioned how they would be protected, studied and transplanted. Some participants stated that much of the wildlife had already been negatively affected by previous developments, including scoters, fish, frogs and harp seals, and they questioned the effects of the Project on these animals.

Some participants expressed concern with the continued flushing ability of the river once the Project would be constructed. In particular, they raised concerns about seasonal flow, freshwater input, and nutrient cycle of the river. They also questioned how the change in downstream seasonal runoff patterns would influence the ecology of deltas, estuaries and coastal areas and how that would in turn affect fish feeding, growth and migration. The Panel also heard other concerns regarding the salinity, temperature, and sea ice formation on the river.

Participants mentioned that trapping grounds were flooded as a result of the development of Churchill Falls and that no compensation for these losses was provided. Some participants worried that flooding of trapping grounds would occur again should the Project proceed and stated that these sites should be well documented in advance of construction. Participants expressed interest in erecting plaques and commemorative historical storyboards. A participant stated that Nalcor's assessment of cultural heritage resources overlooked pathways, such as portages, traplines and trails where artifacts are often found, and did not accurately capture historical resources in the area.

Several participants raised concerns relating to the lack of power access for Labrador coastal communities, especially for the communities that were still on diesel generators. They contended that the Project should benefit these communities more.

Some participants also said that the predicted jobs would be too short term to be considered a benefit. Participants were concerned that Labradorians, in particular Inuit and Métis, would not have equal opportunities for jobs. Participants noted that training was not offered for long-term jobs, only for the short-term ones. One participant noted that most of the people that would qualify for the jobs were already working. In addition, participants were concerned about union rules and how that would affect their ability to get Project jobs.

Participants also stated that Nalcor did not include Inuit knowledge and current land and resource use patterns when determining the impact of the Project and that its analysis of the effects of the Project on traditional use of lands and resources was inadequate.

Benefits

Many participants stated that they would like to see Labrador benefit from the Project and that effort should be made to increase benefits. One participant stated that balance between costs and benefits may not be possible, but that it was possible to increase benefits to outweigh the costs. It was suggested that Nalcor reserve power to facilitate industrial development in the region. It was also suggested that energy be offered at reasonable rates to residents affected by the Project.

Participants mentioned areas of financial support that would be useful, such as a heritage fund to help record historic documentation and a subsidy to help with energy in coastal communities.

One participant stated that any opportunity to increase employment, programs and services was welcome. However, participants stated that more specialized training was required. It was suggested that agreements be put in place to allow people trained to work on the Project to continue to be unionized after construction, thereby improving their access to future work opportunities.

One participant was pleased that the Project could support global efforts to deal with greenhouse gas emissions.

Many participants noted that Inuit and Inuit-Metis groups should be compensated for the Project. A participant hoped that the Project could help revitalize the community.

Sheshatshiu Community Hearing – March 22 and 23, 2011

The community is located approximately 40 kilometres northeast of Happy Valley-Goose Bay. The community is accessible by road year-round. Sheshatshiu is one of the two Innu First Nations in Labrador. As of December 2009, the population of Sheshatshiu was 1,276. Most of the members speak English and the official Aboriginal language is *Innu-aimun*. The Panel visited Sheshatshiu for community sessions held over two days. Approximately 27 people from the community presented to the Panel including one representative from Innu Nation.

Concerns

The Panel heard many participants talk about Sheshatshiu as a troubled and vulnerable community. Many participants noted that there were health problems in the community, particularly related to drugs and alcohol. Participants noted that the problems with drugs and alcohol increased with the availability of money. A participant reported concerns heard from community youth, including with respect to abuse, loss of identity, teen pregnancies and an increase in sexually transmitted diseases. A major concern noted by participants was mental health.

One participant stated that when the Innu lived on the land and participated in traditional ways, there were fewer problems. Innu Nation and other participants were concerned about the loss of the traditional way of life and the effect it would have on future generations.

One participant noted that some problems could be resolved with increased funding; however, another participant commented that the Innu people have chosen to live this way and it was not the fault of the governments or Nalcor.

Participants also expressed concerns about the level of consultation conducted by Nalcor and by their own leaders and did not understand the *Tshash Petapen* Agreement as proposed. One

participant stated that the Project was happening too fast and that the community needed more time to fully understand the impacts and benefits. Another participant recommended that Nalcor incorporate Innu traditional knowledge into the assessment and stated that further consultation with the Innu was required. Some participants were of the opinion that Innu should have the opportunity to decide the fate of the Project because they would be the ones affected.

Some participants were concerned about not having the required skill sets to avail themselves of high-level jobs.

One participant expressed concerns regarding a sunken boat in the river and its effect on aquatic life.

Impacts on Sheshatshiu

Many participants stated that the community was in trouble and that the Project would further affect the health of the community, the children and its future. Participants stated that increased wages would result in increased problems with drugs and alcohol. One participant noted that this already happened with the Voisey's Bay project and it was expected that the impacts from this Project would be larger because the construction period would be longer. She also expressed concerns that residents would not obtain jobs because of existing problems with drugs and alcohol in the community. Another participant recommended that no alcohol be provided on-site.

Some participants were concerned that the Project would affect cultural heritage and that many artifacts had not yet been found in the area. One participant noted that his family burial ground would be flooded by the Muskrat Falls portion of the Project.

Other participants expressed general concerns about how the Project would affect the river, stating that it would affect their way of life because the community used the river for hunting and fishing.

Other Impacts

Many participants expressed concerns about the environmental effects of the Project. Participants were concerned about the impact of construction on animals and fish. Two participants noticed a decrease in the number of seals, fish, animals and birds as a result of the Churchill Falls project. Participants also suggested that if there were a large impact on animals and fish, their traditional lifestyle would be lost.

Several participants noted concerns about the effects of methylmercury in the food chain and worried how this would affect them. Participants stated that there were too few warning signs of mercury from Churchill Falls and felt that Nalcor did not explain fully how they might be affected by methylmercury.

Participants also worried how land use would be affected by the Project. One participant stated that roads that are used to get to hunting cabins would be flooded and worried that residents would not be able to use the land anymore based on experience from other hydroelectric projects. A participant noted that they would not be able to use the land and the river as before.

The Panel heard references to the loss of land, animals and fish that resulted from the Churchill Falls project and how the river changed.

Many participants stated that the Innu would not benefit from the Project. One participant noted that the jobs were only short-term jobs and that Aboriginal people would not avail of highly skilled jobs. Another participant disagreed and stated that the Innu people had nothing to lose with the Project but that agreements with Nalcor and the governments needed to be re-evaluated. It was suggested by one participant that Impacts and Benefits Agreements should be negotiated with all Aboriginal groups that may be affected by the Project.

Several participants noted that the Project would be the first of several that would impact the Upper Lake Melville area. One participant stated that it was impossible to predict the future based on the Project, but was concerned that in the end the Project would result in a loss of land and money for the affected communities. A participant stated that now that the Innu understood the impacts of the Project, they would need to decide if the benefits outweighed the negative impacts.

Benefits

Many participants noted that the Project would provide money, but some stated that the provision of money would not outweigh the costs. Participants stated that they did not need money in the hands of community members but there was a need to provide adequate resources for education, training and social services within the community. Participants expressed a strong interest in having the positive opportunities offered by the Project equally divided among community members.

Many participants noted that the Voisey's Bay project negatively affected the community and leaders were the only ones who benefited. A few participants noted that the Innu did not receive good jobs, if any, and hoped the Project would be different. However, one participant stated that the Voisey's Bay project provided the community with jobs and money to build houses. This participant also stated that the *Tshash Petapen* Agreement would provide substantial revenues, which could support hunting and fishing activities and economic development or could be used to create a pension fund for elders, subsidize power and provide additional social services.

Nain Community Hearing – March 24, 2011

The community is located approximately 225 kilometres north of Happy Valley-Goose Bay. Nain is one of five Inuit communities within the Labrador Inuit Settlement Area. There is no road access to the community. As of 2006, the community had a population of 1,034 persons, over 90 percent of which were Inuit. Their main languages are Inuktitut and English. Approximately 10 percent of them spoke *Inuktitut* most often at home. The Panel conducted the hearing in Nain by videoconference. Three representatives from the Nunatsiavut Government, one representative from the Town of Nain and three people from the community participated in the session.

Concerns

Many participants stated disappointment that the Panel did not attend the hearing in Nain in person, stating that the process made the Inuit feel undervalued. The Nunatsiavut Government and the Town of Nain noted that they had concerns with the process and that Nalcor had not invested enough in Inuit engagement.

The Nunatsiavut Government stated that it was concerned about the lack of separation between the Province and Nalcor and noted that this arrangement did not make for effective decision-making. In addition, it wondered who would be responsible for implementing the measures proposed by Nalcor.

Participants discussed the disadvantages of not having a reliable power source in their community. The Nunatsiavut Government and the Town of Nain stated that the lack of power in coastal communities restricted their ability to foster economic and social growth and improve their quality of life. The Town of Nain provided the Panel with examples of businesses that failed because of high overhead costs due to high electricity prices. Other participants noted that life in Nain was very expensive and that there was little support for infrastructure to sustain the community. The Nunatsiavut Government noted the high cost of providing recreation opportunities in the community because of the high prices of electricity. On the whole, it was noted that additional power access in their community would encourage a sustainable economy and residents would be less likely to leave the community to find employment elsewhere.

The Town of Nain and the Nunatsiavut Government also expressed concerns that the Inuit were losing their language and traditional lifestyle.

Impacts on Nain

The Nunatsiavut Government and the Town of Nain noted that the residents of Nain would feel social and economic impacts from the Project. For example, the Nunatsiavut Government pointed out that there would be a significant strain on the health system in the Upper Lake Melville area on which residents of coastal communities rely for their care.

The Nunatsiavut Government and the Town of Nain expressed concern regarding out-migration from the community. In addition, the Town stated that residents were concerned about increasing housing prices in Happy Valley-Goose Bay since many Inuit move there for jobs or training. The Nunatsiavut Government noted that more training for the youth in Nain was required for them to avail of jobs because many youth were currently unemployed and had no education. The number of jobs created as a result of the Voisey's Bay project did not meet the expectation of Nain residents and they expressed hopes that this Project, should it proceed, would provide better opportunities for employment.

Other Impacts

Some participants referenced changes in the ecosystem from the Churchill Falls project including changes in water quality, animal behaviour and migration patterns. Participants stated that they were concerned these impacts would continue as a result of the Project. The Nunatsiavut Government also noted that the Churchill Falls project affected the flow of the river and was concerned that the Project would exacerbate these problems, including by causing the ice to melt faster. It felt that Nalcor should conduct additional studies as it did not consider the full extent of all environmental effects in the assessment and it did not follow the precautionary principle. A participant also stated that Nalcor should have completed an Inuit-specific land use study to predict effects on Inuit more accurately.

The Panel heard concerns about downstream effects and how methylmercury would affect human health. Some participants worried about the social impact of no longer being able to trust country food. In particular, the Nunatsiavut Government requested that additional work be completed on mercury and ring seal.

A participant noted that Nalcor did not provide information on how revenues from the Project would be spent and how it would benefit the Inuit. He stated that there would be stress on social systems and housing services within Happy Valley-Goose Bay and that Nalcor needed to work to alleviate this. Another participant stated that many communities in the Upper Lake Melville area were already stressed and that towns felt unsafe because support staff and security were not available to take on additional responsibilities.

One participant referenced experiences from the Voisey's Bay project that there was a lot of noise from construction. Another participant expressed concerns that Labrador companies would be outbid for contracts by Newfoundland companies.

Benefits

Most participants stated that there would be very few benefits to the Project considering the expected environmental and social impacts. They stated that the revenues from the Project should be distributed so the communities that would be affected by the Project could receive some benefits. Participants, including the Town of Nain, also stated that the most important benefit from the Project would be access to power. Alternatively, one participant stated that they would be more supportive of the Project if there was a way to make community living less expensive (such as lower the cost of healthcare, transportation, food or other).

The Nunatsiavut Government and the Town of Nain noted that the Project would create some short-term employment; however they noted that training was likely to be generally focussed on urban centres as opposed to Nunatsiavut communities. Participants stated that they would like equal access to business opportunities. These participants noted that there was not enough training to avail of jobs provided by the Voisey's Bay development and they hoped this would be different with the Project. In addition, it was suggested by the Nunatsiavut Government that funding under the Labrador Aboriginal Training Partnership should be extended for many more years.

Several participants recommended that Nalcor partner with the Nunatsiavut Government for research, development and implementation of alternatives. They stated that the Nunatsiavut Government would welcome the opportunity to participate in environmental monitoring and management.

Rigolet Community Hearing – March 30, 2011

The community is located approximately 160 kilometres east of Happy Valley-Goose Bay, on Hamilton Inlet at the entrance of Lake Melville. Rigolet is one of the five Inuit communities within the Labrador Inuit Settlement Area. There is no road access to the community. As of 2006, the community had a population of 269 persons, approximately 90 percent of which were Inuit. Their main languages are *Inuktitut* and English. The Panel conducted the hearing by videoconference with Rigolet. Fourteen people from the community presented to the Panel, including one representative from the Town of Rigolet.

Concerns

Most participants in Rigolet were disappointed that the Panel could not attend the session in person. In addition, the Town of Rigolet stated that the hearing was poorly timed as many residents of Rigolet were conducting traditional activities.

Participants expressed concern that the Panel and Nalcor did not take the concerns of the community of Rigolet seriously and had already determined that the impacts on Rigolet were not significant. A participant stated that Nalcor should have included local Inuit knowledge on the extent and significance of impacts, such as water and ice quality and behaviour and distribution of seals.

One participant raised concerns regarding the relationship between Nalcor and the Province and questioned how the Province could critically evaluate impacts while supporting the development of the Project.

Impacts on Rigolet

A majority of participants, including the Town of Rigolet, expressed concerns about how the Project would affect mercury in fish and seals and therefore affect consumption in Rigolet. A participant stated that Nalcor had not sampled enough to be able to accurately predict impacts on fish. Participants also noted that Nalcor did not include seals in its assessment and this was a primary food source for Inuit living on the coast of Labrador which would also be affected by mercury.

The Town of Rigolet and other participants stated that the Project would have downstream effects and Rigolet should have been included in the assessment. Participants also stated that downstream effects would change the community, its culture and traditions. One participant voiced concerns that future generations would also be affected by the Project.

The Panel heard the Town of Rigolet discuss the historical use of Lake Melville by residents and their current use of the river recreationally and culturally.

Other impacts

The Panel heard references to impacts resulting from the Churchill Falls project and many residents stated that they were concerned this Project would result in similar or worse impacts. These impacts included increases in saltwater, decreases in the cod population, changes in the tides and changes in the timing of ice freeze-up and break-up.

Participants stated that the negative environmental and socioeconomic impacts of the Project would outweigh any local benefits and revenues would not be distributed equally to affected parties. A participant stated that construction of the Project would exacerbate existing anti-Newfoundland sentiments because of the inequitable distribution of benefits. Negative impacts of the Project were also predicted to include increased pressure on the health services of Upper Lake Melville upon which community members rely for their care, decreased affordability of low-income housing in Happy Valley-Goose Bay, increased incidences of emotional and mental health and sexual assaults and the creation of mostly short-term jobs.

Benefits

The Town of Rigolet and many other participants stated that reliable, clean energy should be available to Rigolet. Participants also stated that increased access to power would improve the community's quality of life, encourage sustainable growth, develop business opportunities and reduce environmental impacts.

The Town of Rigolet and one other participant suggested that Nalcor fund an Inuit-specific land and resource study and should involve Inuit in all stages of monitoring. Participants also indicated that Nalcor should be held to strict accountability for monitoring and this monitoring should include downstream impacts on communities such as Rigolet.

It was also recommended that Nalcor complete studies on current mercury levels in fish and seals and study the impacts that increased mercury levels could have on women and children.

Cartwright Community Hearing – March 31, 2011

The community is located approximately 200 kilometres east of Happy Valley-Goose Bay, at the mouth of Sandwich Bay. The community is accessible by road year-round. As of 2006, the population of Cartwright was 552, approximately 75 percent of which were Inuit-Metis. English is

their main language. The Panel conducted the hearing with Cartwright by videoconference. Ten community members presented to the Panel, including four members of the community youth network, one presenter from Henry Gordon Academy, one representative from the Southeastern Aurora Development Corporation and the Town of Cartwright.

Concerns

Many participants, including the Town of Cartwright and the Community Youth Network, stated disappointment that the Panel was unable to arrange a hearing in person in Cartwright. One participant stated that the venue made it difficult for him to express his concerns and Cartwright should have been afforded the same opportunities as other communities to provide its input considering that it would be affected.

Another participant stated that the Province had promised the coastal communities a review of electricity rates and that had not yet happened. He stated that this was very important to communities such as Cartwright. Due to the high electricity rates, the Southeastern Aurora Development Corporation wondered about how many business opportunities had already been lost. Many businesses have had to shut down.

The Community Youth Network stated that the lack of recreational facilities had made the many youth unhealthy and obese.

Impacts on Cartwright

Many participants referenced the disappearance of the cod fishery and linked it to the Churchill Falls project. One participant was specifically concerned about how the salmon industry would be affected. The Community Youth Network and one other participant stated that there was a lack of baseline information on the factors that led to the destruction of the cod fishery and did not agree with Nalcor's prediction that impacts on aquatic life would be minimal. The Community Youth Network and the Town of Cartwright stated that other negative impacts would be associated with the Project, particularly because it was much closer to the community compared to Churchill Falls.

Other Impacts

One participant stated that he was concerned about the baseline environmental studies and the ability for monitoring to occur. He also raised concerns about the effects of the Project on aquatic and terrestrial ecosystems. With respect to the aquatic ecosystem, he noted that he was concerned about contamination by fuel spills and the possible effects resulting from landslides. He also noted concerns with rare shellfish in the area. With respect to the terrestrial ecosystem, one participant noted that the development of Churchill Falls changed the migratory patterns of caribou and this could happen again.

One participant stated that the impacts and mitigation measures had not been properly identified and these measures should be known before the Project is approved.

Participants expressed concerns regarding social disruption during construction, impacts of foreign workers and the interaction between workers and community members. The Southeastern Aurora Development Corporation brought forward concerns on road utilization in the area and suggested that these roads needed to be upgraded before they could be used for Project-related transportation.

Several participants identified issues with respect to distribution of benefits. The Southeastern Aurora Development Corporation stated that an Impacts and Benefits Agreement would be required in order to ensure all communities affected would benefit. Participants were concerned that the Project would only provide power to Central Labrador and therefore would not benefit all of Labrador. One participant stated that Nalcor and the Province had not consulted with everyone affected and that the Project was going to lead to continued alienation between Newfoundland and Labrador. He stated that he was concerned this alienation would lead to negative impacts on social and economic growth.

One participant was concerned that the Project would not lead to a reduction in greenhouse gases as promised. Another participant noted that the Province funded research on alternatives to the Project and requested that this research be reviewed publicly before a decision about the Project is made.

Some participants thought that the environmental assessment process for the Project was being rushed and that the information provided on the registry website was overwhelming.

Benefits

Most participants noted that the benefits were not high enough to outweigh the costs of completing the Project. The Town of Cartwright and another participant stated that there would be no benefits to Cartwright. The Southeastern Aurora Development Corporation stated that without power, some communities would not be able to compete for business opportunities. A suggestion was made to bring Project power to south coast communities by adding an alternating current line to the direct current transmission line from the Project. With affordable and reliable power, Cartwright would be able to connect its businesses to other businesses in the region, be able to support critical infrastructure and in turn support economic development for future generations.

Participants stated that a main interest of Cartwright was obtaining employment during and after construction. One participant stated that wages needed to be increased and it was suggested by the Southeastern Aurora Development Corporation that a two-week rotational schedule would be the best for residents. Another participant hoped that the adjacency principle would be strictly adhered to and noted past experiences where he was unable to get a job despite such a principle being in place. Other participants expressed interest in expanding training to areas outside of Happy Valley-Goose Bay. A representative from Henry Gordon Academy hoped that Nalcor would continue to provide funding to the Labrador Aboriginal Training Partnership after 2012.

A few participants expressed interest in Nalcor using the port of Cartwright during the Project. The Community Youth Network and the Southeastern Aurora Development Corporation also expressed interest in creating a new recreational facility in Cartwright and establishing a heritage fund for infrastructure programs within Labrador.

Happy Valley-Goose Bay Community Hearing – April 2, 2011

The community is the administrative centre of Labrador and is located in the Upper Lake Melville area. As of 2006, the population of Happy Valley-Goose Bay was 7,572, approximately 35 percent of which were Aboriginal persons (half Inuit-Métis, half Inuit). English is their main language. The Panel heard presentations from 14 community members in Happy Valley-Goose Bay including one representative of the Nunatsiavut Government, one representative of NunaKatiget Community Corporation, one member of the Friends of the Grand River and the Central Labrador Economic Development Board.

Concerns

Many participants, including members of the public and Friends of the Grand River raised concerns that the Project was already a "done deal" despite the environmental assessment process not being completed. Friends of the Grand River noted that the Panel should have been comprised of scientific experts.

Several community members raised concerns regarding the need for the Project and were concerned about the validity of Nalcor's assessment because of the lack of separation between Nalcor and the Province. One participant noted that Mud Lake used to rely on diesel power because hydroelectricity was too expensive according to the studies. However, a follow-up study noted that hydroelectricity was less expensive, and at that time Mud Lake received hydroelectric power. Another participant stated that there was no need for the Project considering the availability of recall power from Churchill Falls.

A few participants requested that the Labrador flag be removed from Nalcor's documentation as the Project would not represent the needs of Labrador. The Nunatsiavut Government and other participants stated that communities were not consulted on the Project and the Province and Nalcor did not give sufficient consideration to the needs of Labrador.

Impacts on Happy Valley-Goose Bay

Many participants expressed concerns regarding the impact from the Project on physical infrastructure in Happy Valley-Goose Bay. These concerns included the level of support provided to the port authority for port usage and road usage and upgrades, expressed by Grand RiverKeeper Labrador Inc., landfill usage and decreased lifespan, expressed by the Town of Happy Valley Goose Bay, and increased housing shortages, expressed by the Town of Happy Valley Goose Bay, the Nunatsiavut Government and other participants.

The Panel also heard concerns from the Town of Happy Valley-Goose Bay regarding the impact of the Project on social services stemming from increased pressure due to in-migration. Some participants, including the Nunatsiavut Government, explained that an influx of people would result in longer wait periods and increased demands on a currently stressed healthcare system.

Many participants expressed concerns regarding the risk of a dam failure. Participants, including Grand RiverKeeper Labrador Inc. expressed concerns regarding the lack of an emergency preparedness plan for evacuating flooded areas. Sierra Club Atlantic and another participant wondered how compensation for loss of property in the event of a dam failure would be handled and if values of homes would decrease while insurance rates would increase.

One participant stated that the adverse effects of the Project on the river would be much more significant for residents than businesses because businesses would be able to benefit somewhat from a boom and bust period. The Nunatsiavut Government worried that there would not be a benefit in terms of jobs for residents because the jobs would be short term and contractors would not be obligated to follow the adjacency principle when hiring.

Other Impacts

The Friends of the Grand River and several other participants stated that the Project would have similar effects on the Churchill River to those that occurred with the development of Churchill Falls. Many participants were concerned that the Project would affect the river as a whole, an important symbol to residents. Several participants stated that these effects could not be mitigated and would also be felt by future generations.

Participants also raised concerns about the impacts of the Project on social services and community life in affected communities. Concerns from the NunaKatiget Community Corporation and the Nunatsiavut Government included increased stress in families and family violence, increased alcohol and drug abuse, increased sexually transmitted diseases and increased unplanned pregnancies.

The Nunatsiavut Government, the Friends of the Grand River and several other participants expressed concerns about methylmercury in the food chain in that it would result in the inability to hunt and fish, meaning an end to the practice of traditional activities by Aboriginal persons. The Nunatsiavut Government noted that residents would rely more on store-bought food, which would increase rates of diabetes. Participants recommended that additional mercury testing be done for seals.

With respect to effects on other communities, the NunaKatiget Community Corporation and the Nunatsiavut Government noted that the Project would affect Mud Lake through changes in ice conditions and navigation difficulties. One participant stated that Sheshatshiu was a troubled community which had seen problems as a result of more money being available in the community. The NunaKatiget Community Corporation noted that traplines belonging to North West River residents were flooded as a result of the development of Churchill Falls and predicted that the same would happen with this Project.

Participants raised concerns about the effects of the Project on plants and animals, particularly downstream of Muskrat Falls. The Nunatsiavut Government and several other participants also worried about fish mortality through siltation and increases in saltwater. One participant was concerned whether monitoring of the aquatic environment conducted by regulators would be effective.

One participant expressed concerns about jobs and wondered how many jobs would be permanent positions and how many Inuit would be able to avail of jobs with the Project. The NunaKatiget Community Corporation also expressed concerns that, if it is provided, a wage subsidy program could lead Aboriginal persons to be identified as less skilled.

The Panel heard concerns about the changes in hydroelectricity rates for residents of Labrador. One participant noted that the Project would contribute to separatist feelings between Newfoundland and Labrador because Labradorians did not feel the Project was in their best interests.

Benefits

The Central Labrador Economic Development Board stated that considerable benefits could accrue to Labrador as a result of the Project, including by addressing the power supply issues which would assist regional growth. In addition, communications would be enhanced with the provision of a fibre-optic cable. It stated that the Project, in combination with other future developments, would stimulate the economy.

Many participants, including the Nunatsiavut Government, stated that more benefits in terms of social assistance and economic benefits for Labrador were required, but that even then the benefits would be unlikely to outweigh the costs. The Nunatsiavut Government and the NunaKatiget Community Corporation stated that the job opportunities would be good but all-inclusive opportunities would be needed and more assurances should be given that jobs would be provided to Labradorians. A few participants stated that an Impacts and Benefits Agreement should be required for all groups to ensure that Inuit-Metis have the same access to employment as the Labrador Innu.

Council of the Innu of Unamen Shipu Community Hearing– April 6, 2011

The community is located at the mouth of the Olomane River in the Gulf of Saint Lawrence, approximately 400 kilometres east of Sept-Iles. There is no year-round road access to the community. As of December 2010, there were 1,058 members living within the community and 37 members living outside of the community. Their main languages are *Innu-aimun* and French. The Panel's community hearing session for the Innu of Unamen Shipu took place in Sept-Iles. The community was represented by the chief and its legal advisor.

Concerns

Participants considered that consultation undertaken to date by Nalcor with the community had been inadequate and that insufficient information had been provided in French. Participants also disagreed that Nalcor had gathered sufficient information on land and resource use and historical occupation to draw valid conclusions. Participants considered that Nalcor was treating Innu communities located in Quebec unfairly compared to Aboriginal groups in Labrador with respect to consultation and compensation, in spite of the fact that all Innu feel related to each other. They reiterated that their community, while not being against development in general, did not have sufficient time and financial resources to document environmental effects and inform the Panel.

Participants had concerns about the Project's justification in terms of potential electricity markets, the number of communities in Labrador that would receive power from the Project and the various transmission routes that were being considered.

Participants underlined the subsistence, cultural and spiritual and commercial importance of caribou for the Innu. The imposition of the Labrador/Quebec border and the development of Churchill Falls, which both happened without prior consultation with the Innu, already affected caribou hunting within their traditional territory. Maintaining the integrity of caribou as a source of country food was considered very important because of the cost of food in an isolated community and preference over store-bought food. Participants also inquired whether Nalcor's migratory birds sampling program had been approved by Environment Canada.

Participants questioned whether any contracts have been awarded already by Nalcor for Project-related work. Participants were also of the opinion that the Project would not result in long-term economic benefits for Labrador, in particular with respect to power availability and employment. Finally, participants considered that it was inappropriate to assess the generation and transmission projects separately.

Impacts

Participants considered that the Project would negatively affect caribou, other wildlife, medicinal plants and berry plants and would cause elevated methylmercury levels in fish.

With respect to caribou, the Project would destroy the critical habitat of the Red Wine Mountain herd and would prevent caribou from crossing the Churchill River to reach their primary habitat and Innu hunting grounds located towards Quebec. In turn, community members would have to travel further away to hunt, increasing costs and threatening their supply of country food. Caribou would also be disturbed by many Project-related activities and other existing or proposed projects or activities (such as tree cutting, transmission lines, reservoirs, mining exploration and increased access), some of which were not adequately considered by Nalcor. Negative effects on caribou would result in direct and personal impacts on Innu.

Participants also said that the Project, by itself and in combination with existing or proposed projects or activities throughout their traditional territory, would negatively affect water quality.

Finally, the Project would adversely affect the birthplaces of many Innu from Unamen Shipu and portage routes traditionally used by community members. On the whole, both the generation and transmission line projects would act cumulatively to negatively affect Aboriginal land and resource use and their Aboriginal rights and title.

Benefits

Several youth from Unamen Shipu will be seeking employment in the near-future. There could be benefits from the Project if Nalcor was willing to offer training and employment programs but participants were doubtful that people from their community would actually be able to gain long-term, quality employment from the Project.

Innu Takuaikan Uashat mak Mani-utenam Band Council Community Hearing – April 7, 2011

The community is composed of two reserves: the Uashat Reserve is located on the western outskirts of Sept-Iles and the Maliotenam Reserve is located 16 kilometres east of Sept-Iles near the mouth of the Moisie River. Both reserves are accessible by road year-round. As of December 2010, there were 3,152 members living within the community and 701 members living outside of the community. Their main languages are *Innu-aimun* and French. The Panel's community hearing session for the Innu of Uashat mak Mani-utenam took place in Sept-Iles. The community was represented by their legal advisors, a Band Council staff member and three members of the community.

Concerns

Participants expressed regrets that the Panel did not come into their community to hold the hearing session. They also considered that consultation undertaken to date by Nalcor had not been satisfactory because it was not a meaningful and collaborative dialogue and Nalcor did not provide adequate time and resources to gather the necessary information to assess the effects of the Project.

Participants were of the opinion that both the generation and transmission projects should have been assessed together, along with effects from past projects or activities, including the development of Churchill Falls, because all of them have and would continue to act cumulatively to affect their traditional territory and their Aboriginal rights and title. They expressed how Innu were feeling increasingly alienated from the multiple industrial developments that occurred over time within their traditional territory without proper consultation and accommodation and without them being part of the decision-making process. Participants asserted that their concerns and interests should be taken into account in a significant way and that their consent for the Project was required prior to it being approved because of their continuous occupation of the land to be affected. Representatives from the Band Council made reference to the United Nations Indigenous Rights Declaration, which Canada recently endorsed, and particularly Article 32 relating to the right to make decisions about developments on indigenous lands.

Participants considered that all Innu, whether they lived in Labrador or Quebec, should be consulted and afforded the opportunity to benefit from the Project equally. Many kinship relationships exist between all Innu but resources provided to participate in the environmental assessment were not equal. Participants noted that they would need sufficient financial sources, linguistic support and time to participate more effectively in the assessment.

Participants, including community members, also demanded that their community be compensated for the losses sustained as a result of the development of Churchill Falls.

Impacts

Because of their proximity to the Project area, community members considered that the Project would exacerbate the adverse effects caused by the development of Churchill Falls on their family traditional territories. They described how strong family relationships with the land and between Innu, traditional knowledge, language and cultural connections were adversely affected by the development of Churchill Falls.

The Project would act cumulatively with the increased fragmentation of the land and the increased presence of non-Aboriginal people, including government authorities who imposed hunting restrictions and evicted Innu living in Quebec from their family cabins, restricting the ability of participants and their descendants to use their traditional territory, occupy the land and practice their traditional activities. The Project could also impoverish Innu by impacting caribou, their main source of country food.

While the practice of traditional activities declined in recent years due to the increased importance of wage employment, a decline in fur prices and the obligation to attend school, participants stated that their predictions regarding how the Project would negatively affect their territory remained relevant because Innu youth continued to want to maintain their culture and traditions. Some community members also mentioned that the loss of their territory could exacerbate social problems because the territory was very strongly linked to Innu identity.

Representatives from the band councils also asserted that their Aboriginal rights and titles would be infringed upon by the signature of the *Tshash Petapen* Agreement because of its implications for the overlapping territories of the Innu living in Labrador and Quebec.

Benefits

Representatives from the Band Council hoped that a positive outcome of the review process could be for the Panel to recommend to the Government of Newfoundland and Labrador to enter into a dialogue with Innu living in Quebec and to recognize their land claims in Labrador.

Nutashkuan First Nation Community Hearing – April 7, 2011

The community is located at the mouth of the Nutashkuan River in the Gulf of Saint Lawrence, 336 kilometres east of Sept-Îles. The community is accessible by road year-round. As of December 2010, there were 932 members living within the community and 69 members living outside of the community. Their main languages are *Innu-aimun* and French. The Panel's community hearing session for the Innu of Nutashkuan took place in Sept-Îles. The community was represented by the chief, two Band Council representatives and three members of the community.

Concerns

The Band Council considered that consultation undertaken to date by Nalcor with their community had been unsatisfactory because the Government of Newfoundland and Labrador and Nalcor were treating Innu living in Labrador differently from Innu living in Quebec in spite of all groups having frequently used the same traditional territory. Representatives from the Band Council also stated that the Province's decision not to accommodate and compensate Innu

living in Quebec was going against constitutional obligations and did not respect the fact that their land claim was recognized and accepted for negotiation by the federal government.

The Innu of Nutashkuan should have been offered the same opportunity to negotiate an Impacts and Benefits Agreement as Innu Nation, because both groups are part of the same larger Aboriginal nation. Participants noted that while the imposition of the Labrador/Quebec border made access to their traditional territory more difficult, it did not alter their rights to practice traditional activities over its entire extent, including in Labrador and in the area that would be affected by the Project. Members of the community continue to travel as far as the Smallwood Reservoir and all the way to North West River to hunt caribou. They travel by snowmobile, by car, by plane, and by train.

Band Council representatives were of the opinion that their consent for the Project was required because it could affect their Aboriginal rights and title and the federal and provincial crown had the duty to consult and accommodate them regarding all aspects of the Project, including those not considered in the Panel's review. The Government of Newfoundland and Labrador should also recognize their land claim for portions of their traditional territory located in Labrador.

They also pointed out that they were not provided with sufficient resources to document the community's historical, anthropological and legal position with respect to the Project. Participants considered that studies similar to those conducted with Hydro-Quebec for the Romaine hydroelectric project would have been more appropriate than what was offered by Nalcor.

Impacts

Community members told the Panel about their experience on the land and their connections with their traditional territory. Any impacts on their traditional territory, in particular on their hunting and trapping grounds, would be strongly felt by the Innu and would be considered significant, even if it is only over a small portion of their territory. Among past negative experiences that the Panel heard about were the disturbances and impacts of low-level military flying.

The Band Council stated that the Project would have adverse impacts on their members' Aboriginal rights and title, their cultural and traditional activities, spiritual connections, ability to access their traditional territory and on the lands and resources over which these activities and connections depend.

Caribou in particular would be negatively affected by disturbances caused by the Project, on both a short-term and a long-term basis, because caribou must have access to large pristine areas to survive according to participants. Caribou hunting is at the centre of the Innu identity, is an important source of country food and its management is part of the distinct lifestyle of the Innu of Nutashkuan. Participants also thought that the Project would increase caribou harvesting by non-Aboriginal hunters and would increase hunting pressures in areas to be unaffected by the Project but that are currently heavily used by Innu. Participants considered that the Project should not be allowed to move ahead without having conducted an independent study about the long-term effects on caribou throughout the Labrador/Quebec peninsula. This study should consider traditional knowledge.

The fact that the Project would negatively affect and pollute their traditional territory meant that it would not be possible to bring back younger people on the land and teach them about Innu culture and traditions. Being able to go back on the land was considered by some community

members as a good way of alleviating some of the social problems that the community is currently experiencing, such as drugs, alcohol addiction and gambling.

Benefits

The Panel heard that the only way to offset the adverse impacts that the Project may have on their traditional territory, their culture and their practice of traditional activities would be if the Innu of Nutashkuan were able to benefit economically from the Project. Financial benefits that could be gained from the Project could serve to fund youth programs to teach traditional activities so that culture and traditions are not lost. Other government sources of funding are generally insufficient to do this.

Council of the Innu of Ekuanitshit Community Hearing – April 7, 2011

The community is located at the confluence of the Mingan River and the Saint Lawrence River, approximately 200 kilometres east of Sept-Îles. The community is accessible by road year-round. As of December 2010, there were 539 members living within the community and 26 members living outside of the community. Their main languages are *Innu-aimun* and French. The Panel's community hearing session for the Innu of Ekuanitshit took place in Sept-Îles. The community was represented by the chief, its legal advisor and six members of the community.

Concerns

Participants were of the opinion that Nalcor failed in its obligation to gather sufficient information on land and resource use to effectively assess the effects of the Project. Participants discussed their expectations about information gathering following their experience with the La Romaine Hydroelectric Development Project and considered that Nalcor's proposal did not meet these expectations. The community would need adequate financial resources, time and expertise to participate adequately in the environmental assessment. They considered that their consent was necessary for the Project to proceed but they could not provide it without having adequate resources.

Participants attributed Nalcor's lack of information gathering efforts to the fact that it was reflecting the provincial government's policy not to engage with Innu groups outside of Labrador and it was not accurately considering current and historical land and resource use over the area to be affected by the Project, and those areas in close proximity to the Project area. Participants considered themselves to be part of the same group as the Innu living in Labrador and they mentioned that close relationships still exist between the various groups.

Participants never surrendered the portions of their traditional territory that fell within the Project area. Community members discussed the evolution of their land and resource use within that territory, including with respect to seasonal travel patterns, activities practiced along the way, relationships and the responsibility they feel towards looking after the land. Literature excerpts submitted corroborated the stories of the Elders present at the session. While there had been a decline in the practice of traditional activities in recent time, in particular because of the creation of reserves, the obligation to attend residential schools and the imposition by governments of harvesting regulations, and some aspects of their culture and traditions have disappeared, participants said they remain strongly attached to the land and its resources.

Participants were also of the opinion that both the generation and transmission projects should have been assessed together because they were complementary components of the same project: the generation project could not be justified if power could not be transmitted to the Island of Newfoundland and beyond.

Impacts

Participants and community members considered that fish, wildlife and medicinal plants would be affected by the Project in the same way that they were affected following the development of Churchill Falls. With respect to caribou, participants questioned Nalcor's methodology for determining the effects of the Project, especially with respect to the Lac Joseph herd. Some participants also considered that water quality throughout their traditional territory would be negatively affected by the Project and other industrial developments.

On the whole, participants considered that the Innu living in Ekuanitshit would be more affected by the Project than the Innu living in Natuashish and yet, all Innu living in Labrador benefited from all the resources provided to Innu Nation. According to participants, this was only due to the arbitrary presence of the Labrador/Quebec border.

Naskapi Nation of Kawawachikamach Community Hearing – April 8, 2011

The community is located approximately 15 kilometres northeast of Schefferville. There is no year-round road access to the community. As of December 2010, there were 643 members living within the community and 88 members living outside of the community. Their main language is *Naskapi*, followed by English and then French. Approximately 30 percent of them speak English only. The Panel's community hearing session for the Naskapi of Kawawachikamach took place in Sept-Iles. The community was represented by the chief, a representative of Naskapi Nation and their legal advisor.

Concerns

Participants discussed the environmental effects they observed following the development of the James Bay project, especially on caribou. They also noted that their community was never consulted about the development of Churchill Falls even though they held Aboriginal rights and title that were adversely affected by the Smallwood Reservoir.

In addition to their settled claim in northern Quebec, participants stated that they maintained Aboriginal rights and title in Labrador which were never extinguished through treaties, including in the Project area. They described some of the land and resource use activities they continuously practiced in Labrador, including caribou hunting, geese harvesting, and fishing. They also own cabins in Labrador. They pointed out that they were directly related to the Innu living in Labrador.

With respect to caribou hunting, participants noted how they traditionally moved with the George River herd throughout its annual range for hunting and they stated that they intend to continue to hunt caribou wherever the herd is located, including in the Project area and in spite of hunting restrictions imposed by the Government of Newfoundland and Labrador.

They considered that Nalcor did not properly consider evidence showing historical and current land and resource use in the Project area and they concluded that Nalcor wrongly denied that they had Aboriginal rights and title that would be affected by the Project. Participants also discussed how, in their opinion, the provincial government failed in its obligations to recognize their Aboriginal rights and title in Labrador and to consult and accommodate them.

While participants discussed their experience and involvement with caribou management in Labrador and Quebec, they also indicated that they did not have the financial resources necessary to study the effects of the Project on the environment, including the effects on caribou.

Participants also talked about the importance of education for maintaining their culture and language and the necessity to consider traditional knowledge when managing natural resources.

Impacts

The participants' greatest concern about the Project was its potential effect on caribou and the resulting impacts on their traditional activities, caribou being their principal source of country food. Participants challenged Nalcor's ability to predict the effects of the Project on caribou because it was difficult in their opinion to say where caribou herds would be located from year to year. Participants also discussed how disturbances caused by industrial developments affected caribou in the past and how, should this happen again because of this Project, their hunting activities could be adversely affected because they have observed that it takes a long time for caribou to return to an area after they have been disturbed. They also estimated that the George River herd would not be the only herd that could be affected by the Project.

Participants also mentioned that their fishing activities could be affected because the Project would cause elevated levels of methylmercury in fish.

Innu Nation of Matimekush–Lac John Community Hearing – April 8, 2011

The community is composed of two reserves, Matimekush and Lac John, which are both located approximately 520 kilometres north of Sept-Îles. There is no year-round road access to the community. As of December 2010, there were 759 members living within the community and 88 members living outside of the community. Their main language is *Innu-aimun*, followed by French and then English. Approximately 50 percent of them speak French only. The Panel's community hearing session for the Innu of Matimekush–Lac John took place in Sept-Îles. The community was represented by the chief and a community member.

Concerns

Participants discussed the different consultation approaches taken by the Government of Newfoundland and Labrador with respect to industrial development occurring in close proximity to their community, including in Labrador. For mining projects, recent consultations only occurred after approvals had been granted. Since then, the community was approached by the Province to discuss consultation guidelines for all future industrial development, the possibility of negotiating impacts and benefits agreements, co-management initiatives for the George River caribou herd and the implications of the *Tshash Petapen* Agreement on Innu living in Québec who have overlapping traditional territories with Innu living in Labrador.

Participants described the problems created by the imposition of the Labrador/Quebec border, including reduced access to their lands and resources. They stated that while all Innu are part of the same Aboriginal group, the border arbitrarily split the traditional lots of 34 Innu families from Matimekush–Lac John and Uashat Mak Mani-utenam and some of these lots fell into Labrador. As such, participants indicated that they could not accept the *Tshash Petapen* Agreement until overlapping claims were resolved because the agreement, as currently proposed, would affect their Aboriginal rights and title in Labrador.

Participants also disagreed with the intent of the *Tshash Petapen* Agreement to compensate Innu living in Labrador for the adverse impacts of the development of Churchill Falls because their own ability to practice traditional activities was equally affected by this development. For participants, the Project would be closely linked to the development of Churchill Falls because

75 percent of the water that would flow into the Lower Churchill reservoirs would originate in Churchill Falls and compensation should be similarly offered to them at this time.

Participants also noted that they should be consulted about industrial development taking place within their traditional territory because they were the most knowledgeable about fish and wildlife and how past projects or activities affected these resources. They also talked about the importance of maintaining the integrity of their traditional territory so that the livelihood of current and future generations could be protected. They noted that gaining employment may come at the expense of environmental damages.

Impacts

Participants stated that the Project would have adverse impacts on their Aboriginal rights and title if there was no overlap agreement for the Smallwood Reservoir area negotiated as part of the *Tshash Petapen* Agreement. The absence of a successful overlap agreement would be a further infringement upon their rights and title which were also not considered by treaties negotiated in northern Quebec.

Participants expressed concerns about the cumulative effects of the Project in combination with past, current and possible future mining projects around Schefferville, in particularly for caribou. The Project would also act cumulatively with increased caribou harvesting due to commercial hunting. Their traditional hunting grounds, which extend throughout the herd's range, would continue to be adversely affected if industrial developments, brought by the availability of hydroelectric power, continue to occur.

Benefits

Participants expressed doubts about the ability of their community to benefit economically from industrial activities taking place within their traditional territory. For participants, the only way for Aboriginal groups to benefit economically from natural resource development that may affect their Aboriginal rights and title would be for the Crown to resolve land issues through treaties. This would also bring legal certainty and consistency to the development process.

APPENDIX 6 LIST OF APPEARANCES AT THE PUBLIC HEARING

General Hearing Sessions – Happy Valley-Goose Bay

(March 3, 4, 5 and April 1, 2011)

Name	Affiliation
Abbass, Mayor Leo	Town of Happy Valley-Goose Bay
Airhart, Jill	Personal Capacity
Aylward, Kevin	NunatuKavut Community Council
Barkman, Lowell	Town of North West River
Barnes, Bob	Nalcor
Beck, Dr. Brenda	Grand RiverKeeper Labrador Inc.
Bennett, Bill	Transport Canada
Bennett, Gilbert	Nalcor
Bieger, Tilman	Fisheries and Oceans Canada
Blake-Rudkowski, Clarice	Grand RiverKeeper Labrador Inc.
Brown, Herb	Personal Capacity
Burlingham, Todd	Nalcor
Corkum, Jeff	Environment Canada
Davis, Eldred	Personal Capacity
Decker, Randy	Transport Canada
Fowlow, Brian	Labrador North Chamber of Commerce
Hendriks, Rick	Innu Nation
Jacque, Keith	Labrador Aboriginal Training Partnership
Kemuksigak, Patricia	Nunatsiavut Government
Knopper, Dr. Loren	Nalcor
Learning, John	Personal Capacity
Learning, Richard	Personal Capacity
Lethbridge, Kirk	Personal Capacity
Lyall, Terry	Personal Capacity

Name	Affiliation
Marcocchio, Bruno	Sierra Club Atlantic
Michelin, Debbie	Personal Capacity
Montague, Chris	NunatuKavut Community Council
Nuna, Richard	Innu Nation
Penashue, Elizabeth	Personal Capacity
Penashue, Francis	Personal Capacity
Peyton, Sterling	Labrador North Chamber of Commerce
Pilgrim, Paulette	Personal Capacity
Riche, Deputy Grand Chief George	Innu Nation
Riche, Grand Chief Joseph	Innu Nation
Roberts, Daphne	Personal Capacity
Rosenberg, Dr. Dave	Grand RiverKeeper Labrador Inc.
Rudd, Murray	Grand RiverKeeper Labrador Inc.
Ruffman, Alan	Geostorage Associates
Russell, Keith	Nunatsiavut Government
Russell, Todd	Personal Capacity
Sheldon, Tom	Nunatsiavut Government
Troke, Glen	Environment Canada
Tuttauk, Ed	Sivunivut Community Corporation
Whiteway, Julie	Fisheries and Oceans Canada
Wolfrey, Charlotte	Nunatsiavut Government

Special Session – Happy Valley-Goose Bay

(April 13, 2011)

Name	Affiliation
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Henderson, Rob	Nalcor
Hull, Rob	Nalcor

Name	Affiliation
Humphries, Paul	Nalcor
McCarthy, Jim	Nalcor
Organ, Marion	Nalcor

General Hearing Sessions – St. John's (April 4 and 5, 2011)

Name	Affiliation
Anger, Claude	Geostorage Associates
Aylward, Kevin	NunatuKavut Community Council
Barnes, Bob	Nalcor
Bennett, Gilbert	Nalcor
Burlingham, Todd	Nalcor
Cadigan, Robert	Newfoundland and Labrador Oil and Gas Industries Association
Clarke, Bob	International Brotherhood of Electrical Workers – Local 1615
Gibson, Dr. John	Natural History Society
Goobie, Mayor Gary	Town of Holyrood
Hart, Daphne	Women in Resource Development Corporation

Name	Affiliation
Mitchell, Greg	NunatuKavut Community Council
Montague, Chris	NunatuKavut Community Council
Perry, Jeremiah	Personal Capacity
Raheem, Dr. Najem	Grand RiverKeeper Labrador Inc.
Ruffman, Alan	Geostorage Associates
Russell, George	NunatuKavut Community Council
Steele, Dr. Don	Natural History Society
Thomey, Paul	St. John's Board of Trade
Walzthoni, Tracy	Personal Capacity

Community Hearing Sessions

Mud Lake (March 19, 2011)

Name	Affiliation
Bennett, Gilbert	Nalcor
Broomfield, Eugene	Personal Capacity
Burlingame, Todd	Nalcor
Chaulk, Christine	Personal Capacity
Chaulk, Craig	Personal Capacity
Chaulk, Laura	Personal Capacity
Cooper, Bill	Personal Capacity
Kirby, Vyann	Personal Capacity

Name	Affiliation
McCarthy, Jim	Nalcor
Organ, Marion	Nalcor
Pryse-Phillips, Amy	Nalcor
Rumble, Watson	Personal Capacity
Thomson, Carly	Personal Capacity
White, Verna	Personal Capacity

North West River (March 21, 2011)

Name	Affiliation
Baikie, Leander	Personal Capacity
Barkman, Lowell	Town of North West River
Bennett, Gilbert	Nalcor
Blake, Edward Sr.	Personal Capacity
Blake, Ted	Personal Capacity
Burlingame, Todd	Nalcor
Campbell-Hibbs, Mina	Personal Capacity
Cooper, Paul	Personal Capacity

Name	Affiliation
McCarthy, Jim	Nalcor
McLean, Carl	Nunatsiavut Government
McLean, Ernie	Personal Capacity
Organ, Marion	Nalcor
Neilsen, Scott	Personal Capacity
Tuttauk, Ed	Sivunivut Community Corporation

Sheshatshiu (March 22 and 23, 2011)

Name	Affiliation
Andrew, Caroline	Gathering Voices Project
Andrew, Danina	Personal Capacity
Andrew, Elizabeth	Personal Capacity
Andrew, Helen	Personal Capacity
Armitage, Peter	Innu Nation
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Gregoire, Pien	Personal Capacity
Hervieux, Natasha	Gathering Voices Project
Hill, Robin	Personal Capacity
Hurley, Natasha	Gathering Voices Project
Jack, Mishen	Innu Elder
McCarthy, Jim	Nalcor
Michel, Shimun	Innu Elder
Michel, Joachim	Personal Capacity
Montague, Herman Jr.	Personal Capacity
Nuna, Richard	Personal Capacity
Nuna, Mani-Martinen	Innu Elder
Organ, Marion	Nalcor

Name	Affiliation
Pastitshi, Jeffrey	Personal Capacity
Pastitshi, Kathleen	Personal Capacity
Penashue, Antoine	Innu Elder
Penashue, David	Personal Capacity
Penashue, Elizabeth	Personal Capacity
Penashue, Francis	Personal Capacity
Penashue, Jack	Personal Capacity
Penashue, Joseph	Personal Capacity
Penashue, Lizette	Innu Elder
Penashue, Max	Personal Capacity
Penashue, Peter	Personal Capacity
Penashue, Pien	Innu Elder
Penunsi, Sebastian	Innu Elder
Pone, Paul	Personal Capacity
Rich, Lauren	Personal Capacity
Rich, Mary Kathleen	Personal Capacity
Rich, Patrick	Personal Capacity
Schwarz, Dr. Fred	Nalcor
Snow, Francesca	Personal Capacity
Trimper, Perry	Nalcor

Nain (By Videoconference) (March 24, 2011)

Name	Affiliation
Andersen, AngajukKâk Tony	Town of Nain
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Ikkusek, Nancy	Personal Capacity
Haye, Emma	Personal Capacity

Name	Affiliation
Lampe, Johannes	Nunatsiavut Government
Lyall, James	Nunatsiavut Government
Murphy, John	Personal Capacity
Sheldon, Tom	Nunatsiavut Government

Rigolet (By Videoconference) (March 30, 2011)

Name	Affiliation
Baikie, Marilyn	Personal Capacity
Bennett, Ray	Personal Capacity
Blake, Max	Personal Capacity
Burlingame, Todd	Nalcor
McCarthy, Jim	Nalcor
Michelin, Sam	Personal Capacity
Organ, Marion	Nalcor
Palliser, Russell	Personal Capacity
Palliser, Sam	Personal Capacity
Pottle, Richard	Personal Capacity

Name	Affiliation
Rich, Marie	Personal Capacity
Rich, Richard	Personal Capacity
Shiwak, First Minister Darryl	Nunatsiavut Government
Shiwak, Fred	Personal Capacity
Wolfrey, AngajukKâk Charlotte	Town of Rigolet
Wolfrey, David	Personal Capacity
Wolfrey, Tony	Personal Capacity

Cartwright (By Videoconference) (March 31, 2011)

Name	Affiliation
Allison, Anthony	Personal Capacity
Burlingame, Todd	Nalcor
Clark, Kellie Ann	Personal Capacity
Clark-Howell, Shannon	Personal Capacity
Dicker, Christian	Personal Capacity
Dyson, Matthew	Personal Capacity
Howell, Mayor Rosetta	Town of Cartwright
Gillis, Blair	Personal Capacity

Name	Affiliation
Leeder, Colleen	Nalcor
Martin, John	Personal Capacity
Morris, Kim	Henry Gordon Academy
Notley, Roxanne	Southeastern Aurora Development Corporation
Organ, Marion	Nalcor

Happy Valley-Goose Bay (April 2, 2011)

Name	Affiliation
Blake, Max	Personal Capacity
Bennett, Gilbert	Nalcor
Best, Carol	Central Labrador Economic Development Board
Burlingame, Todd	Nalcor
Cole, Denise	Personal Capacity
Cull, Linda	Personal Capacity
Felsberg, Susan	Personal Capacity
Hefler-Elson, Jennifer	NunaKatiget Community Corporation (also Personal Capacity)

Name	Affiliation
Kemuksigak, Patricia	Nunatsiavut Government
Leaming, James	Friends of Grand River
Leaming, John	Personal Capacity
Lethbridge, Kirk	Personal Capacity
McCarthy, Jim	Nalcor
McGillivray, Dr. Jane	Personal Capacity
Michelin, Debbie	Personal Capacity
Oliver, Stanley	Personal Capacity
Organ, Marion	Nalcor
Trimper, Perry	Nalcor

Council of the Innu of Unamen Shipu (Held in Sept-Iles) (April 6, 2011)

Name	Affiliation
Bacon, Chief George	Council of the Innu of Unamen Shipu
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Côté, Martin	Nalcor

Name	Affiliation
Lévesque, François	Council of the Innu of Unamen Shipu
McCarthy, Jim	Nalcor
Organ, Marion	Nalcor
Trimper, Perry	Nalcor

Innu Takuaiakan Uashat mak Mani-utenam (Held in Sept-Iles) (April 7, 2011)

Name	Affiliation
Ashini, Elizabeth	Personal Capacity
Ashini, Madeleine	Personal Capacity
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Laurent, Catherine	Personal Capacity
Côté, Martin	Nalcor
McCarthy, Jim	Nalcor

Name	Affiliation
MacKenzie, Armand	Innu Takuaiakan Uashat mak Mani-utenam Band Council
Organ, Marion	Nalcor
Trimper, Perry	Nalcor
Ochman, Patricia	Personal Capacity
Vollant, Gloria	Innu Takuaiakan Uashat mak Mani-utenam Band Council

Nutashkuan First Nation (Held in Sept-Iles)
(April 7, 2011)

Name	Affiliation
Bellefleur, Chief François	Nutashkuan First Nation
Bennett, Gilbert	Nalcor
Blake, Hector	Personal Capacity
Burlingame, Todd	Nalcor
Côté, Martin	Nalcor
McCarthy, Jim	Nalcor
Malec, Antoine	Personal Capacity

Name	Affiliation
Malec, Daniel	Nutashkuan First Nation
Malec, Jean	Nutashkuan First Nation
Organ, Marion	Nalcor
Trimper, Perry	Nalcor
Wapistan, Anne-Marie	Personal Capacity
Wapistan, Normand	Personal Capacity

Council of the Innu of Ekuanitshit (Held in Sept-Iles)
(April 7, 2011)

Name	Affiliation
Basil, Sylvie	Personal Capacity
Bellefleur, Abraham	Personal Capacity
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Côté, Martin	Nalcor
McCarthy, Jim	Nalcor
Michel, Patrick	Personal Capacity
Mollen, Hélène	Personal Capacity

Name	Affiliation
Mollen, Raphaël	Personal Capacity
Organ, Marion	Nalcor
Piétacho, Agathe	Personal Capacity
Piétacho, Chief Jean-Charles	Council of the Innu of Ekuanitshit
Schulze, David	Council of the Innu of Ekuanitshit

Naskapi Nation of Kawawachikamach (Held in Sept-Iles)
(April 8, 2011)

Name	Affiliation
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Côté, Martin	Nalcor
Einish, Chief Louis	Naskapi Nation of Kawawachikamach
Mameamskum, John	Naskapi Nation of Kawawachikamach

Name	Affiliation
McCarthy, Jim	Nalcor
Organ, Marion	Nalcor
Prévost, Robert	Naskapi Nation of Kawawachikamach

Innu Nation of Matimekush – Lac John (Held in Sept-Iles)
(April 8, 2011)

Name	Affiliation
André, Conrad	Personal Capacity
Bennett, Gilbert	Nalcor
Burlingame, Todd	Nalcor
Côté, Martin	Nalcor

Name	Affiliation
McCarthy, Jim	Nalcor
McKenzie, Chief Rhéal	Innu Nation of Matimekush–Lac John
Organ, Marion	Nalcor

Topic-Specific Hearing Sessions – Happy Valley-Goose Bay

Need, Purpose and Alternatives

(March 7 and 8, 2011)

Name	Affiliation
Benefiel, Roberta	Grand RiverKeeper Labrador Inc.
Bennett, Gilbert	Nalcor
Bown, Charles	Department of Natural Resources
Burlingame, Todd	Nalcor
Goodfellow-Baikie, Robin	Personal Capacity

Name	Affiliation
Goulding, Steve	Nalcor
Hull, Rob	Nalcor
James, Ann	Nalcor
Marcocchio, Bruno	Sierra Club Atlantic
Raphals, Philip	Grand RiverKeeper Labrador Inc.

Economic Impacts

(March 9, 2011)

Name	Affiliation
Best, Carol	Central Labrador Economic Development Board
Bennett, Gilbert	Nalcor
Bowles, Ron	Department of Labrador and Aboriginal Affairs
Burlingame, Todd	Nalcor
Devereaux, Kate	Department of Human Resources, Labour and Employment
Dinn, Paul	Department of Education
Garland, Reginald	Department of Environment and Conservation
Goudie, Joe	Melville Native Housing Association
Goulding, Steve	Nalcor
Leeder, Colleen	Nalcor
Locke, Dr. Wade	Nalcor

Name	Affiliation
Lyall, Wanda	Melville Native Housing Association
Malone, Rita	Department of Innovation, Trade and Rural Development
Mavin, Walt	Department of Human Resources, Labour and Employment
Morina, Lara	Central Labrador Economic Development Board
Nochasak, Minister Susan	Nunatsiavut Government
Paddon, Terry	Department of Finance
Pike, Matthew	Melville Native Housing Association
Sheldon, Tom	Nunatsiavut Government

Reservoir Preparation (March 10-11, 2011)

Name	Affiliation
Barnes, Bob	Nalcor
Benefiel, Roberta	Grand RiverKeeper Labrador Inc.
Bennett, Gilbert	Nalcor
Bieger, Tilman	Fisheries and Oceans Canada
Blake, Max	Personal Capacity
Blake-Rudkowski, Clarice	Grand RiverKeeper Labrador Inc.
Brooks, Dr. Gregory	Natural Resources Canada
Burlingame, Todd	Nalcor
Carroll, Colin	Department of Natural Resources
Cavallaro, Kate	Natural Resources Canada
Clarke, Keith	Fisheries and Oceans Canada
Deering, Keith	Department of Natural Resources
Harris, Reed	Nalcor
Hendriks, Rick	Innu Nation

Name	Affiliation
Hingston, Michael	Environment Canada
Jennings, Darren	Department of Natural Resources
Lamontagne, Dr. Maurice	Natural Resources Canada
Marcocchio, Bruno	Sierra Club Atlantic
Mandville, Len	Department of Natural Resources
McCarthy, Jim	Nalcor
McLean, Clyde	Department of Environment and Conservation
Meade, Jim	Fisheries and Oceans Canada
Nuna, Jimmy	Innu Nation
Organ, Marion	Nalcor
Pittman, Darren	Department of Natural Resources
Rich, Paul	Innu Development Limited Partnership
Roberge, Michelle	Fisheries and Oceans Canada

Aquatic Environment (March 15-16, 2011)

Name	Affiliation
Anderson, Celeste	Nunatsiavut Government
Barnes, Bob	Nalcor
Benefiel, Roberta	Grand RiverKeeper Labrador Inc.
Bennett, Gilbert	Nalcor
Bieger, Tilman	Fisheries and Oceans Canada
Blake, Edward	Nunatsiavut Government
Bronson, Roni	Health Canada
Burgess, Neil	Environment Canada
Burlingame, Todd	Nalcor
Campbell-Hibbs, Mina	Nunatsiavut Government
Cavallaro, Kate	Natural Resources Canada
Clarke, Keith	Fisheries and Oceans Canada
Colbert, Michael	Department of Environment and Conservation
Davis, Eldred	Personal Capacity
Denning, Allison	Health Canada
Hanchar, Dorothea	Department of Environment and Conservation

Name	Affiliation
Harris, Reed	Nalcor
Liao, Dr. Shawna	Natural Resources Canada
Marcocchio, Bruno	Sierra Club Atlantic
McCarthy, Jim	Nalcor
Parent, Michael	Natural Resources Canada
Paterson, Renée	Department of Environment and Conservation
Picco, Robert	Department of Environment and Conservation
Pottle, Derrick	Nunatsiavut Government
Roberge, Michelle	Fisheries and Oceans Canada
Sheldon, Tom	Nunatsiavut Government
Tobin, Derek	Fisheries and Oceans Canada
Trimper, Perry	Nalcor
Williams, Melva	Nunatsiavut Government
Wolfrey, Charlotte	Nunatsiavut Government
Wolfrey, Dave	Nunatsiavut Government

Terrestrial Environment (March 17-18, 2011)

Name	Affiliation
Benefiel, Roberta	Grand RiverKeeper Labrador Inc.
Bennett, Gilbert	Nalcor
Blake-Rudkowski, Clarice	Grand RiverKeeper Labrador Inc.
Burlingame, Todd	Nalcor
Crowley, Shannon	Department of Environment and Conservation
Gilliland, Scott	Canadian Wildlife Service
Graham, Jeri	Department of Environment and Conservation
Hanson, Alan	Canadian Wildlife Service
Hickey, Earle	Nalcor
Innes, Larry	Innu Nation

Name	Affiliation
Linfield, Karen	Department of Environment and Conservation
Marcocchio, Bruno	Sierra Club Atlantic
Moores, Shelley	Department of Environment and Conservation
Newbury, Tina	Nalcor
Nuna, Richard	Innu Nation
Organ, Marion	Nalcor
Ray, Dr. Justina	Innu Nation
Schmelzer, Dr. Isabelle	Department of Environment and Conservation
Simons, Brock	Nalcor
Trimper, Perry	Nalcor
Turner, Bruce	Nalcor

Social and Cultural Impacts (March 29, 2011)

Name	Affiliation
Beals, Petrina	Mokami Status of Women Council
Bennett, Bill	Transport Canada
Bennett, Gilbert	Nalcor
Biasutti-Brown, Marine	Nunatsiavut Government
Bronson, Jackie	Nalcor
Burlingame, Todd	Nalcor
Connell, Delia	Labrador-Grenfell Regional Health Authority
Decker, Randy	Transport Canada
Drake, Martha	Department of Tourism, Culture and Recreation
Hallett, Vicki	Mokami Status of Women Council
Johnson, Darrell	Department of Health and Community Services
Kemuksigak, Patricia	Nunatsiavut Government
Kinney, Michelle	Nunatsiavut Government
Leeder, Colleen	Nalcor
MacLean, Shaun	Labrador Frienship Centre

Name	Affiliation
MacLellan, Heather	Women's Policy Office
Mercer, Delphina	Department of Tourism, Culture and Recreation
Neilsen, Scott	Personal Capacity
Newhook, Vanessa	Department of Natural Resources
Oliver, Stanley	Labrador Frienship Centre
Ripaso, Theresa	Nalcor
Schwarz, Dr. Fred	Nalcor
Skanes, Roy	Nalcor
Sheldon, Tom	Nunatsiavut Government
Shrimpton, Mark	Nalcor
Simms, Colleen	Department of Health and Community Services
Storey, Keith	Nalcor
Stratton, Dr. Faith	Department of Health and Community Services
Woolam, Dr. Gabe	Labrador-Grenfell Regional Health Authority

Environmental Management, Monitoring and Follow-up (March 30, 2011)

Name	Affiliation
Abbass, Mayor Leo	Town of Happy Valley-Goose Bay
Benefiel, Roberta	Grand RiverKeeper Labrador Inc.
Bennett, Gilbert	Nalcor
Bieger, Tilman	Fisheries and Oceans Canada
Blake, John	Department of Environment and Conservation
Blake-Rudkowski, Clarice	Grand RiverKeeper Labrador Inc.
Burlingame, Todd	Nalcor
Clarke, Keith	Fisheries and Oceans Canada
Curran, Rick	Department of Government Services
Goodfellow-Baikie, Robin	Personal Capacity
Hartman, Dr. Gordon	Grand RiverKeeper Labrador Inc.
Hendriks, Rick	Innu Nation
McCarthy, Jim	Nalcor
McCurdy, Darlene	Department of Government Services
McLean, Clyde	Department of Environment and Conservation

Name	Affiliation
Meade, Jim	Fisheries and Oceans Canada
Miller, Kristen	Department of Environment and Conservation
Nuna, Richard	Innu Nation
Organ, Marion	Nalcor
Paterson, Renée	Department of Environment and Conservation
Picco, Robert	Department of Environment and Conservation
Roberge, Michelle	Fisheries and Oceans Canada
Russell, Ken	Department of Government Services
Simmons, Derek	Department of Municipal Affairs
Trimper, Perry	Nalcor
Troke, Glenn	Environment Canada
Wyman, Jacques	Town of Happy Valley-Goose Bay

Cross-cutting Issues (March 31, 2011)

Name	Affiliation
Barnes, Jeff	Nalcor
Bennett, Gilbert	Nalcor
Bieger, Tilman	Fisheries and Oceans Canada
Burlingame, Todd	Nalcor
Leeder, Colleen	Nalcor
Lethbridge, Dwight	Personal Capacity
Luttermann, Annette	Personal Capacity
Luttich, Stuart	Grand RiverKeeper Labrador Inc.

Name	Affiliation
Marcocchio, Bruno	Sierra Club Atlantic
McCarthy, Jim	Nalcor
Organ, Marion	Nalcor
Roberge, Michelle	Fisheries and Oceans Canada
Trimper, Perry	Nalcor
White, Bob	Nalcor
Whiteway, Julie	Fisheries and Oceans Canada

Closing Remarks – Happy Valley-Goose Bay (April 14-15, 2011)

Name	Affiliation
Abbass, Mayor Leo	Town of Happy Valley-Goose Bay
Beals, Petrina	Mokami Status of Women Council
Benefiel, Roberta	Grand RiverKeeper Labrador Inc.
Bennett, Gilbert	Nalcor
Benuen, Chief Sebastien	Chief of Sheshatshiu Band Council
Best, Carol	Central Labrador Economic Development Board
Blake-Rudkowski, Clarice	Grand RiverKeeper Labrador Inc.
Campbell-Hibbs, Mina	Personal Capacity
Davis, Eldred	Personal Capacity
Goodfellow-Baikie, Robin	Personal Capacity

Name	Affiliation
Hallett, Vicki	Mokami Status of Women Council
Hefler-Elson, Jennifer	Personal Capacity
Lethbridge, Kirk	Personal Capacity
Marcocchio, Bruno	Sierra Club Atlantic
Nuna, Richard	Innu Nation
Peyton, Sterling	Labrador North Chamber of Commerce
Raphals, Philip	Grand RiverKeeper Labrador Inc.
Riche, Grand Chief Joseph	Innu Nation
Sheldon, Tom	Nunatsiavut Government
Thomey, Paul	St. John's Board of Trade
Thomson, Carly	Grand RiverKeeper Labrador Inc.
Tshakapesh, Chief Simeon	Chief on Natuashish Band Council

Secretariat Staff

Name
Crull, Carrie
Devin, Sarah
Fitch, Gavin (Legal Counsel)
Graham, Tom
Graham, Phil
Jamault, Lucille
Johnstone, Terry
Meier, Sonya
Michaud, Livain
Roy, Annie
Sendall, Courtney
Thonney, Jean-Pierre

APPENDIX 7 LIST OF DOCUMENTS RELATED TO ABORIGINAL RIGHTS AND TITLES PROVIDED BY ABORIGINAL GROUPS DURING THE PANEL REVIEW

These documents contain information submitted to the Panel by each of the Aboriginal groups related to their respective Aboriginal rights and title.

Canadian Environmental Assessment Registry (CEAR) numbers refer to numbers attributed to documents posted on the Canadian Environmental Assessment Registry website for the Lower Churchill Project (<http://www.ceaa-acee.gc.ca/050/index-eng.cfm>, Reference Number 07-05-26178)

Innu Nation

- Letter to the Panel on Innu of Labrador Aboriginal Rights Considerations in the Area of the Project, July 23, 2010 (CEAR 452)
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- Hearing Closing Remarks by Grand Chief Joseph Riche, April 15, 2011 (Hearing Transcript, Volume 34, April 15, 2011)

Nunatsiavut Government

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- Comments on Nalcor's Responses to Information Requests – Additional 30-day Public Consultation Period, December 18, 2009 (CEAR 284)
- Comments on Nalcor Responses to Information Requests Round 4, September 23, 2010 (CEAR 499)
- Comments on Nalcor's Consultation Assessment Report, October 21, 2010 (CEAR 513)
- Hearing Opening Remarks by the Nunatsiavut Government (Hearing Transcript, Volume 4, March 5, 2011)
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- Letters to Nalcor, August 13 and September 7, 2010 (CEAR 433 and CEAR 476)
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- A Plan of the Bay of Chateaux on the Coast of Labrador (CEAR 704)
- NunatuKavut Land Claim Area (CEAR 712)
- Historic Inuktitut Nomenclature in Central & Southern Labrador and Northern Newfoundland (CEAR 714)
- Map – Hamilton Inlet (CEAR 715)
- Hearing Presentation (Hearing Transcript, Volume 28, April 5, 2011)

- A Brief Paper to the Joint Review Panel on the Lower Churchill Hydroelectric Generation Project, April 13, 2011 (CEAR 1299)

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- Comments regarding the 30-day Consultation Period on the Translation of Documents, January 19, 2010 (CEAR 302)
- Comments on Nalcor's Consultation Assessment Report, October 12, 2011 (CEAR 511)
- Comments on Nalcor's Responses to Information Requests JRP.165 and JRP.166, January 13, 2011 (CEAR 558)
- Hearing Submission, April 6, 2011 (CEAR 1203)
- Hearing Presentation (Hearing Transcript, Volume 29, April 6, 2011)

Nutashkuan First Nation

- Hearing Submission, April 2011 (CEAR 1226)
- Hearing Presentation (Hearing Transcript, Volume 30, April 7, 2011)

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- Comptois, Robert. *Occupation et utilisation du territoire par les Montagnais de Mingan* (excerpts), 1983 (CEAR 1225)
- Maps 4 and 5 Prepared for the Comptois Study, 1983 (CEAR 1225)
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- Comments on Nalcor's Consultation Assessment Report, October 21, 2010 (CEAR 514)
- Hearing Submission, April 7, 2011 (CEAR 1228)
- Hearing Presentation (Hearing Transcript, Volume 30, April 7, 2011)
- Map – Beaver lots held by families (CEAR 1327)
- Hearing Submission and Presentation by Elizabeth and Madeleine Ashini and Catherine Laurent (Hearing Transcript, Volume 30, April 7, 2011)

Nakaspi Nation of Kawawachikamach

- Comments on the Environmental Impact Statement, May 22, 2009 (CEAR 176)
- Letter to Panel on Naskapi Nation Land Claim in Labrador, March 31, 2010 (CEAR 338)
- Hearing Submission, April 2011 (CEAR 1227)
- Hearing Presentation (Hearing Transcript, Volume 31, April 8, 2011)

Innu Nation of Matimekush–Lac John

- Hearing Presentation (Hearing Transcript, Volume 31, April 8, 2011)
- Hearing Submission, April 13, 2011 (CEAR 1314)

APPENDIX 8 FRAMEWORK FOR DETERMINING WHETHER SIGNIFICANT ADVERSE ENVIRONMENTAL EFFECTS ARE JUSTIFIED AND WHETHER THE PROJECT SHOULD BE APPROVED

This framework was developed from a number of sources, including criteria suggested in the literature, criteria applied in previous panel reports, participant input on draft criteria released by the Panel prior to the hearing, and information provided during the hearing process.

At the heart of the decision-making framework is the concept that the effects, risks and uncertainties of the Project should be fairly distributed among affected communities, jurisdictions and generations, and that the Project should result in net environmental, social and economic benefits.

The framework consists of two main components:

- The first component is a set of sustainability criteria designed to assist in identifying the range of effects on sustainability the Project is predicted to have, and to work toward minimizing adverse effects and maximizing benefits.
- The second component is a set of principles that set out the proposed approach to residual effects. These principles are designed to assist in assessing the range of positive and negative social, economic and environmental effects of the Project and to determine whether, in light of the identified range of effects, risks and uncertainties, the Project is expected to make a net positive contribution to sustainability.

Sustainability Criteria to Predict the Effects and Risks of the Project, and to Identify Uncertainties

1. ***Ecological Effects, Benefit, Risks and Uncertainties*** – Are biophysical systems adequately protected throughout all phases of development, construction, operation, and decommissioning of the Project?
 - Is the long-term integrity of biophysical systems ensured and are the irreplaceable life support functions protected upon which human as well as ecological well-being depends?
 - Are complex interactions sufficiently understood?
 - Are potential adverse effects minimized?
 - Does the Project reduce threats to the long-term integrity of ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit?
2. ***Economic Effects, Benefit, Risks and Uncertainties*** – Does the Project provide net economic benefits to the people in the area surrounding the Project, in the province, and in Canada?
 - Does the Project enhance practically available livelihood choices and the power to choose?
 - Does the Project reduce gaps in sufficiency and opportunity (and health, security, social recognition, political influence, etc.) between the rich and the poor?

3. ***Social and Cultural Effects, Benefit, Risks and Uncertainties*** – Does the Project contribute to community and social well being of all potentially affected people? Is it compatible with their cultural interests and aspirations?
- How will the Project affect individual communities?
 - Does the Project assist in building the capacity, motivation and habitual inclination of individuals, communities and other collective decision-making bodies to apply sustainability requirements?
 - Does the Project encourage more open and better informed deliberations, greater attention to fostering collective responsibility, and more integrated use of individual and collaborative collective decision-making practices?
 - Does the Project strengthen individual and collective understanding of ecology and community, foster customary civility and ecological responsibility, and build civil capacity for effective involvement in collective decision making?
4. ***Fair Distribution of Effects, Risks and Uncertainties*** – Are the effects, risks, and uncertainties fairly distributed among potentially affected individuals, communities, regions and other interests?
- Does the Project consider carefully the geographical distribution of the social, economic and environmental effects, risks, and uncertainties of the Project?
 - Will affected individuals and communities have the prerequisites for a decent life and the opportunities to seek improvements that do not compromise equivalent opportunities for future generations?
 - Is the diversity of those whose needs are being addressed appreciated? Is their involvement ensured?
 - Does the Project emphasize less materially and energy intensive approaches to personal satisfactions among the advantaged, to permit material and energy sufficiency for all?
5. ***Present versus Future Generations*** – Does the Project succeed in providing economic and social benefits now without compromising the ability of future generations to benefit from the environment and natural resources in areas potentially affected by the Project?
- Does the Project favour options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably?
 - Does the Project assist in returning current resource exploitation and other pressures on ecological systems and their functions to levels that are safely within the perpetual capacity of those systems to provide resources and services likely to be needed by future generations?
 - Does the Project apply precaution, by respecting uncertainty, avoiding both well and poorly understood risks of serious or irreversible damage to the foundations for sustainability, planning to learn, designing for surprise, and managing for adaptation?

- Will decision-makers act on incomplete but suggestive information where social and ecological systems that are crucial for sustainability are at risk?
 - Has the proponent designed for surprise and active adaptation, favouring diversity, flexibility and reversibility?
 - Has the proponent ensured the availability and practicality of backup alternatives?
 - Has the proponent established mechanisms for effective monitoring and response?
6. **Integration** – Are all principles of sustainability applied together, seeking mutually supportive benefits and multiple gains?
- Integration is not the same as balancing because greater efficiency, equity, ecological integrity and civility are all necessary for sustainability, therefore, positive gains in all areas are essential for sustainability.
 - What happens in any one area affects what happens in all of the others?
 - It is reasonable to expect, but not safe to assume, that positive steps in different areas will be mutually reinforcing.
 - A sustainable project requires positive steps in all areas, at least in general and at least in the long term.
 - Sustainability requires decision-makers to resist convenient immediate compromises unless they clearly promise an eventual gain.

A key goal of these criteria is to encourage the search for integrated solutions that provide net immediate and long-term gains in all areas. This approach should reduce the need to consider whether negative effects in one area are outweighed against positive effects in another area. In recognition that this ideal is rarely achieved, the following section proposes principles to guide the consideration of the range of positive and negative effects identified through the application of the six criteria above.

Principles to Guide the Project Decision in Light of the Range of Positive and Negative Effects of the Project

Maximum Net Gains

- Overall, the Project should deliver net progress towards meeting the requirements for sustainability; it should seek mutually reinforcing, cumulative and lasting contributions and should favour achievement of the most positive feasible overall result, while avoiding significant adverse effects.

Avoidance of Significant Adverse Effects

- A significant adverse effect on any sustainability requirement area can only be justified if the alternative is the acceptance of a more significant adverse effect.

- Compromise is acceptable if it avoids further decline or risk of decline in a major area of existing concern, or if it improves prospects for resolving problems properly identified as global, national and/or local priorities.
- Incomplete mitigation of significant adverse effects is not acceptable if stronger mitigation efforts are feasible.

Principles of Fairness

- No current or future generation should bear an unreasonable share of the adverse effects, risks or costs, or be denied a reasonable share of the benefits of the Project.
- No geographic region affected by the Project should bear an unreasonable share of the adverse effects, risks or costs, or be denied a reasonable share of the benefits.
- The Project should make a net positive contribution to sustainability in each of the three main areas, the environment, the economy, and social conditions.

Explicit and Transparent Justification

Any compromises on the overall effects, risks and uncertainties of the Project and their distribution should be accompanied by an explicit and transparent justification based on openly identified, context specific priorities as well as the sustainability decision criteria.